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I.

PERFORATION OF THE SEPTUM NARIUM, FROM
A STUDY OF TWENTY-FIVE CASES WITH
REGARD TO ETIOLOGY AND PATHO-
LOGIC SIGNIFICANCE.

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On account of the fact that the rhinologist rarely has this condition under his observation until the process has terminated into a finished or nearly finished product, we have accepted the above designation rather than the one so frequently used by others, namely, perforating ulcer of the septum. Indeed, the perforation of the septum while in the state of ulceration, or even afterward, is a condition producing so little annoyance to the patient that it is rarely called to the attention of the general practitioner and often only discovered by the specialist during routine examination. Occasionally a patient with a perforation will consult a surgeon on account of symptoms directly referable to the perforation, such as bleeding; to obtain relief from the whistling sound heard in breathing; or on account of the perforation having been accidentally detected. Perforations are usually single, rarely multiple.

Jurascz mentions two cases with double perforations, P. H. Gerber mentions a double perforation, and Natier has observed multiple perforations. They are usually round or oval in shape when involving the cartilaginous septum; when in the bone and cartilage, or alone in the bone, they are irregular in outline with their long axis in the antero-posterior direction.

The appearance of the perforation varies according to the stage in which the process is discovered. It may be in the stage of extension with the whole circumference of the perforation in an active stage of ulceration or the finished product with thin, glistening, thoroughly cicatrized edges. The amount of incrustation depends not only upon the absence or presence of ulceration, but also upon the condition of the mucosa of the affected nasal chamber. Thus we may find the edges laden with or completely free from crust.

It would be almost useless to go into a consideration of the frequency of perforation, as I find so great a discrepancy between the percentage given by various observers as to make an average of these almost worthless. Sufficient is it to say that perforations of the septum are not of infrequent occurrence. Weichselbaum, Hajek and Zuckerkandl's experiences upon the cadaver would indicate that many are never detected during life. I cannot agree with V. Lange in the statement which he makes that many are overlooked during examination in the living.

These deformities are observed at all periods of life. I have observed them as early as the fourteenth year and as late as the seventieth year of life. It would be of more interest, and of infinitely more practical value, if we could learn at what period of life the primary lesion most frequently manifests itself, which leads onward to the destructive changes noted.

Perforation of the septum can be from a pathologic and etiologic point of view divided into two groups, viz., 1st: Those with a known etiologic factor and a definite pathologic history; 2nd: Those without a known etiologic factor and an indefinite pathologic history. Under the primary grouping are included those perforations due to trauma, syphilis, lupus, tuberculosis, etc., conditions arising from organic diseases. Under the second grouping are those

not uncommon forms of perforations of the cartilaginous septum, not due to any organic disease and presenting no histologic evidence of constitutional vice, always limited to the cartilaginous septum, slowly destructive, and which terminate by spontaneous healing, the so-called simple or idiopathic perforating ulcer of the septum. It is to this type of ulceration that I will in this paper more particularly direct your attention.

In my private practice I have observed forty-one cases of perforation of the septum, but it is only in the last five years that I have more than noted the fact of the mere existence of the perforation. Since 1895 I have carefully investigated the clinical histories of all cases of this character coming under my care, twenty-five in all, and the deductions drawn from these cases is the basis of this thesis.

The development of the perforation in organic diseases producing destruction of the septum is the characteristic local lesion of the peculiar disease which acts as the provocative agent. In the lupus ulceration, which is exceedingly rare, the process has never been observed in the earliest stages, but it is no doubt due to the breaking down of the nodes and the formation of ulcers with resulting necrosis and perforation of the cartilage.

In the tubercular destruction is the process more clearly to define. Zuckerkandl states that tubercular ulcerations of the nasal mucous membrane are usually rare. According to Gerber, the percentage in his clinic to all nasal affection is 0.28 per cent. The process begins with the formation of the tubercular tumor or the tubercular ulcer, both of which have a special tendency to develop on the cartilaginous septum. These lesions of tuberculosis heal or undergo extension with resulting destruction by ulceration of the cartilaginous septum. Schaffer saw eight cases of tuberculous tumors on the cartilaginous septum, four of which ended in perforation of the septum. Seifert in his report of thirty cases of tubercular ulceration of the nose, found ulceration ten times exclusively limited to the septum, of which two had produced perforation.

In all of these cases we not only find the histologic elements of a tubercular lesion but also frequently the presence of the tubercle bacillus.

The syphilitic lesions of the nasal chambers are in the form of mucous patch, superficial ulcers and gummatous infiltration. The mucous patch is by all acknowledged to be an exceedingly uncommon nasal affection in syphilis, as is also the superficial ulcer. The superficial ulcer, when it appears, is no doubt due to a gummy deposit. We are therefore forced to the conclusion that the gummatous tumor is the factor in syphilis that alone produces the extensive involvement and destruction which leads to perforation of the septum in this disease.

The development of the perforation in the second class which has no pathologic evidence as due to organic disease, under which heading comes that large class of perforations apparently due to no assignable cause and among which we must group those which apparently take place in typhoid, typhus or other fevers, is no doubt in the form of an ulceration, however produced. Of this type of perforation I have had three cases under my observation almost from the initial stage.

In the first case, that of a young woman, anemic, badly nourished and with a strong tubercular family history, I was consulted on account of discomfort in the left nasal cavity, sneezing, and occasional hemorrhages. On examination I found in the left cavity over the posterior portion of the cartilaginous septum a well marked ulcer about half a centimeter in diameter. The whole ulcer had a crater-like form. The circumference of the ulcer was opaque, and raised above the surface, evidently due to the inflammatory piling up of translucent and partially desquamated epithelial cells. The submucosa, each apparently destroyed to a less extent than the epithelial layers, added to this inverted, cone-like appearance of the ulcer. The cartilage was denuded but not perforated. This case was under my observation for several months before eventual destruction through the cartilage ensued with resulting perforation through the mucous of the opposite side.

In the second case, also of a young woman, well nourished and with a non-tubercular history, I was consulted on account of a whistling sound in breathing. In the upper surface of the cartilage I found a small pinhole-like perforation. The line of demarkation between the heal-

thy mucosa and ulceration could not be made out. The healthy mucosa seemed to extend, macroscopically, directly to the edges of the perforation. The inner edge of the circumference of the perforation presented the characteristic evidences of ulceration. This perforation gradually extended, seemingly, by a process of molecular disintegration, without hemorrhage or crust formation about the ulcer, until now it is a healed perforation of about a centimeter in diameter.

The third case was observed in a man who consulted me on account of hay fever. In my first examination I found a small round ulcer, about two milimeters in diameter, extending down to the cartilage, the latter showing a characteristic yellowish ulcerated appearance. The ulceration through the mucosa seemed as if it were punched out down to the cartilage of the septum. Within three days perforation had resulted and a rapid molecular destruction ensued, so that in the course of three weeks nearly the whole of the cartilaginous septum was destroyed. The ulceration throughout its whole course presented the characteristics of ulceration described in the second case.

The etiologic factors have already in an indirect manner been mentioned in the consideration of the manner of the development of the ulcers. We will now discuss seriatim and more definitely the etiologic factors of perforations.

There is no doubt that congenital defects may exist in the septum, by which means there is a communication through the continuity of the septum of one nasal chamber with its fellow. This form of perforation has been described by Hyrtl, and he mentions three such cases as observed by him. Hildebrandt describes a perforation in his own case as probably being congenital. These perforations may have been congenital, and they are vouched for by two eminent anatomists, but they certainly lack the evidences of proof. Rupp quotes an authentic case reported from Beeley, by Germus, in which parts of the vomer were missing with a resulting communication. As other anatomists describes the possibility of such a condition existing, and as there is no plausible reason why such a state should not exist, we must accept this as an etiologic influence.

Traumatic. Under this classification we must include the larger number of perforations through the cartilaginous and bony septum that have been made through surgical intervention during efforts to remove spurs and correct deviations. Ofttimes such perforations are unavoidable and are not due to the want of surgical skill and dexterity, but unfortunately such is not always the case. This form of perforation, after cicatrization, does not usually give rise to inconvenience unless there is a great destruction of the septum. Direct traumatism may be responsible for the perforation and such cases are mentioned by Rupp and Bosworth; certain acids, mercurials and cements.

Pressure and Inflammatory Activity. It is readily conceivable that hard growths which grow relentlessly, forcing asunder bony structure, would produce a perforation of the septum, but I doubt very much the possibility of soft tumors being capable of producing such a result, although vouched for by no less an authority than Jurascz. I am rather inclined to believe that the perforation in Jurascz's cases existed before the development of the mucous growth. It is singular to note how infrequent are perforations of the septum as a result of hematoma and abscess of the septum. Fischenich, Thorner, Ricci and Zaufal have observed perforations as the result of these conditions. I have had eight cases of abscess of the septum under my observation, and while they were all attended with considerable destruction of the cartilaginous septum and resulting external deformity, they all healed without perforation.

Rosenthal states that lupus, when it attacks the mucous membrane of the nose, affects by preference that over the cartilaginous septum. He further states that the ulceration of the nodes frequently results in perforation with great destruction of the septum. Victor Lange states that he had seen directly under his observation an advanced case of lupus that ended with perforation. He gives two other cases of perforation due to lupus. Chiari also describes a perforation so produced. There is no doubt that this is a very rare form of perforation, as rhinologic literature contains very few instances of this type.

Tuberculosis of the nasal mucous membrane is an ex-

ceedingly rare condition, if one accepts the dictum of authorities and his personal experience. I have never seen a case of tubercular involvement of the nose in my private practice. Rosenthal states that in comparison to syphilis it is an exceedingly rare disease. Zuckerkandl states that tubercular ulcerations of the nasal mucous membrane are exceedingly rare. Lange, Hajek, Schaffer (4 cases), Morrell Mackenzie (2 cases) and others have described perforations of the septum due to tubercular ulcerations.

Syphilis plays an important role as a causative agent in the production of perforation of the septum. This disease is the most frequent known constitutional condition giving rise to this form of destruction. Gummatous infiltration seems to have a particular proneness to development in the structure of the septum in syphilis involving the nasal cavity. These deposits are found most frequently in the mucous membrane over the osseous portion of the septum and at the junction of the cartilage and bone. I cannot subscribe to the statement made by Jurascz and others that the cartilaginous septum alone is often involved in this form of destruction. I do not believe that syphilitic destruction would be self-limiting, as such is not its history when involving other tissues. I am rather inclined to the views expressed by Moritz Schmidt, that one should not class a perforation of the septum as syphilitic unless the bone participates in the destructive process. Indeed, I would consider it very hazardous to advance the opinion that a healed perforation solely involving the cartilaginous septum was syphilitic in its origin, unless there were undoubted constitutional evidences of syphilis previous to the development of the ulceration. And, conversely, in all perforations of the septum solely within the osseous septum, involving cartilage and bone, in which trauma, tuberculosis and lupus could be excluded, I would without hesitation regard them as syphilitic in origin even without positive evidences of constitutional taint. I wish also to call attention to the fact that where the cartilaginous septum alone seems involved, we may have simultaneous involvement of the osseous septum which may be overlooked, although if searched for could be detected.

I can possibly illustrate better what I mean in the fore-

going sentence by describing one of two similar cases of this type that have been under my observation. In this case a female patient had a large perforation through the cartilaginous septum that had healed around two-thirds of its circumference. At the floor the perforation manifested still an ulcerating surface which bled frequently, and was attended with the formation of offensive crusts. There was constant and annoying pain in the upper incisor teeth. The teeth had been examined by several dentists and found to be normal in every respect. On careful examination with a probe, I found a small sequestrum forming a portion of the palatine plate of the maxillae at their junction with the cartilage. Removal of this sequestrum and the administration of the appropriate constitutional treatment rapidly brought about cicatrization. Such a sequestrum might be thrown off without being detected and the edges cicatrizing, the perforation would be accepted as a syphilitic perforation of the cartilage without involvement of bone.

As with most forms of perforation, the syphilitic are unfortunately not brought to our observation until the greater amount of destruction has taken place, and the sequestrum has more or less completely exfoliated with resulting deformity of the septum. The question of the syphilitic origin of a perforation is one that should be approached with great caution, unless there is destruction of the bony septum or positive constitutional manifestations of syphilis elsewhere. The percentage of syphilitic to all causes is very great, although different authors vary considerably in the proportion; Juraszcz gives 62 per cent., Schaffer 70, Victor Lange 50, Campbell 80, Thrasher 20, while my own is 30.

The etiology of that large class of perforations which one meets as involving solely the cartilaginous septum, which are not due to any of the conditions above mentioned, is one which is shrouded in considerable doubt. On account of the fact that this form of ulceration has never been under observation in a connected chain from the initial pathologic changes until the perforation has been completed, various theories have been offered to explain the local changes which may have preceded the ulceration of the mucosa, which is usually the first alteration in the integrity of the structure observed. The three cases of perfor-

ation, which I have above described, came under my care about as early in their history as in the case of such changes in the mucosa under the care of any other observer; yet all three of these cases showed no local change in their immediate contiguity that could in any way explain their origin. The septa in all of these cases were as nearly straight as they are found in the majority of noses. There was no history of hemorrhage in two cases; and in the one in which it was present it had only existed, in all probability, since the ulceration in the mucosa had taken place. They were all refined people who disclaimed the habit of picking in the nose, were not annoyed by difficult breathing, and were not employed in occupations which exposed them to irritating vapors and dusts.

The theory that perforations are the result of the destructive activity of local irritation and injury to the septum produced by boring with the finger nail against the septum is one that can hardly be considered as tenable; nor should it be deemed worthy of serious consideration if the integrity of the mucous membrane is normal at the time of the application of the violence. There is no doubt that an average amount of scratching and boring may be applied to a perfectly normal mucous membrane without producing any permanent destructive change. After the initial local changes have taken place, then one can well see that this process may play a most important role as a contributor to the destruction. Zuckerkandl, Bresgen, Bosworth, V. Lange, and many others mention this as a local cause.

Bosworth gives as a local cause the presence of a deflected septum, the dust laden atmosphere and other impurities producing an erosion. It seems to me that this is a cry of utter despair in searching for an assignable cause. That deflected septa are very frequently perforated no one will deny, but that the active changes producing the destruction is an erosion caused by dust laden atmosphere, which is Nature's effort to surmount the obstruction, is thoroughly illogical and in no sense tenable. The local change is the same in the deflected as in the straight septum. Most of the theories that have been advanced, claim the lesion to be primarily due to a local vascular change in the area affected. Voltolini was the first to advance along this line and he described the process as being due to

a hemorrhagic ulcer. The hemorrhages taking place in the mucosa, cause local impairment of the enervation and result in the production of an ulcer. Zuckerkandl also ascribes the process to a hemorrhagic change in the mucosa which he designated by the term xanthosis. He states that in a form of rhinitis extensive hemorrhage takes place in the structure of the mucosa, the mucosa acquiring later, when the process has run its course, during which the escaped blood has undergone a typical metamorphosis, a yellowish, yellow-green, or rusty brown, conspicuous coloring. This change he designates xanthose. He claims this xanthose to be an essential predisposing cause of perforating ulcer of the septum. For the development of the atrophy of the septum, as well as for the ulcer, he describes the following stages:

1. Injury, prolonged mechanical irritation (perhaps scratching) of the mucous membrane of the septum.
2. Hemorrhage in the mucous membrane. Xanthosis.
3. Destruction of the capillary and thereby defective nourishment.
4. Partial atrophy, or perforating ulcer, after infection has or has not taken place.

Hajek accepts the hemorrhagic theory plus infection as the cause of the changes produced in the septum. He states that in the pseudo-membrane, not seldom, there is found a golden-green pigment that may be very diffuse. This circumstance proves that before the necrosis of the mucous membrane a hemorrhage had taken place therein. There is no doubt that pigment may be found distributed in the mucous membrane of the septum, as a result of hemorrhage into its substance, without convincing us that such discovery of pigment is positive proof of coagulation necrosis. Hajek ascribes the development of the ulcer and the destructive changes in the septum to the activity of the staphylococcus pyogenes aureus and the streptococcus pyogenes.

Dietrich's theory is that of localized thrombosis, while Rosenfeld advances the belief that the change is due to a tropho-neurosis.

An interesting theory is advanced by J. R. Straw as of etiologic moment in the production of perforation. He resides in Ashland, Wisconsin, where the tem-

perature during winter often falls as low as 30 degrees below zero. He states that the inhabitants of this region are subject to frequent freezing of the nose and throat. As a result of the frequent freezing and necessary thawing out there is produced an erosion of the mucous membrane.

It is interesting to observe that all the theories advanced, except Rosenfeld's, have in common a localized change taking place in the arterial supply to a limited area of the septum. This localized change is ascribed as due to irritation produced in some instances by the drying of mucus over the area affected and to the change produced by the frequent boring into the nasal cavity. We frequently observe this change described, that is, the local condition which locally predisposes to the development of the ulcer over and over again in cases which heal or are never followed by perforation. I cannot but accept that the underlying cause of this destructive change is a destruction of the innervation of the cartilaginous septum whereby the resisting power of the structure is so impaired that an ulceration with molecular destruction of the cartilage takes place. Victor Lange mentions this view also and states that we have to do with a pronounced disturbance of the nutrition and cites the *ulcus ventriculi* and the perforating ulcer of the foot as analogous.

How is this disturbance of the innervation produced? There is no doubt that many diseases can occur in the necessary nutritive change that may be provocative of the disintegration of the septal mucosa attended upon the formation of a septal perforation. When perforation results during typhoid, typhus, and rheumatic fever and in diphtheria, it is in all probability not due to any pathologic influence that these diseases exert locally upon the septum, but is rather due to the impaired innervation of the septum that occurs as a result of the lowered vital activity in the height of these disturbances.

In active or latent tuberculosis the nutritive activity of various tissues may be more or less impaired, these changes being most active in the mucous membranes. Hajek states that in his thirty-three cases of perforation observed on the cadaver, thirty-one showed some evidence of tuberculosis either in the cured or active stage.*

*Of the 2,136 bodies examined 990 died of tuberculosis—46.3 per cent. of all cases.

Weichselbaum's cases were all observed in tubercular subjects. It is interesting also to observe that only two or three of Weichselbaum's cases were true tubercular perforations—all of Hajek's and the remainder of Weichselbaum's were histologically non-tubercular simple perforations of the septum. Hajek was so impressed with this observation that he remarks as to the singular frequency of evidence of acute or chronic tuberculosis, or of healed tuberculosis in some form, in perforating ulcer of the septum.

Again Hajek states almost in his closing sentence: "One would feel tempted to accept the lessened resistance of the mucous membrane of the tuberculous as the opportune moment for the origin of the ulcerous formation, through which we would have found the before mentioned individual disposition for the pathogenesis—did not the observation of the living show that as a rule we were not dealing with tuberculous individuals. The spontaneous healing of the ulcer also speaks against such an assumption."

It is really surprising to find Hajek after such an able exposition of the subject, make such a final deduction. From a finding in five living subjects, which on the face of the histories given he made no attempt to investigate with regard to their tubercular history, he overthrows the enormous preponderance of findings as discovered in the dissecting room. On the cadaver he finds in his perforated cases healed tuberculosis, which may have been present in all of his five living cases, but beyond the power of physical detection. He distinctly states that in all of his cases in the cadaver the ulcerations were of the simple variety, although occurring in tubercular subjects; yet in his concluding sentence he states that the spontaneous healing speaks against them being disposed to by the tubercular condition. If the tubercular condition did not militate against their healing before death as demonstrated in the cadaver, why should it in the living? The condition is not a tubercular ulcer, but a process which is probably predisposed to by a tubercular diathesis, and Hajek seemed to be strongly impressed and almost ready to accept it.

In a thorough study of seventeen non-tubercular, non-

specific perforations which have come under my observation, I find that eleven of the subjects either have tuberculosis, or a strong family tubercular history. This occurrence gave occasion to thought and the question arose as to the possible predisposing etiologic relationship between simple perforation of the septum and latent or present tuberculosis. After investigating and noting the frequency of septal perforation in those who had past or present evidences of tubercular lesion, I was forced to conclude that there must be a predisposing relationship. We cannot lightly throw aside the evidences given by numerous observers as to the local changes which lead up to the development of the ulcer; that is, the local vascular changes such as hemorrhage into the mucosa, xanthosis, thrombosis, and coagulative necrosis, all of which indicate a local impaired nutritive change in the mucosa, because such changes are frequently observed in cases which do not produce ulceration or terminate in perforation. Nor can the bacillary theory of Hajek be as ruthlessly laid aside. Hajek had clearly proved that these micro-organisms, the staphylococcus pyogenes, and streptococcus pyogenes, are found in the tissue about the margin of the ulcer. Whether these micro-organisms are merely an incidental deposit during the life history of the destructive change, as they are more or less constantly present in the nasal chambers, or the actively producing local agent, it is quite difficult to decide.

Independent of the local changes present, it seems that there must be some constitutional determining cause which in a certain series of cases lessens the normal nutritive activity of the affected tissue, so that a molecular disintegration, or ulceration, takes place, such ulceration extending until the normal nutritive changes are sufficiently strong to resist the onward encroaching ulceration. It seems quite consistent to suppose that during the severity of a typhoid, typhus or acute exanthem, such a lowering of the nutritive activity takes place in the septum, as well as in other tissue, so that local changes already present might lead onward to further destructive changes. Such a lowering of nutritive activity can readily be ascribed to the tubercular and tubercularly inclined.

I shall herewith give an outline of the eleven cases with a tubercular or latent tubercular history.

1. A youth 20 years of age. Large perforation. One sister died of tuberculosis. Brother with deformity resulting from caries of spine. Ulceration supposed to have occurred during typhoid fever.

2. A man, aged 50, had tuberculosis as a youth. Relieved by life spent in the west. Large perforation, perfectly cicatrized.

3. A man, aged 40. Large perforation. His mother died of tuberculosis. Anemic mucous surfaces. Left recurrent paralysis, signs of inactive consolidation at left apex.

4. Youth, aged 14. Atrophic rhinitis. Large perforation. Parents died of tuberculosis.

5. Youth, aged 16. Large perforation. One sister died of tuberculosis. Another sister with incipient tuberculosis. Perforation supposed to have occurred during typhoid fever.

6. A man aged 40. Large perforation. Has had several hemorrhages from lungs. Anemic mucous surface. Consolidation over right apex. Now in Asheville. Child operated for adenoids.

7. A woman, aged 70. Extensive cartilaginous destruction. Father, mother and two brothers died of tuberculosis. In youth said to have tuberculosis. Only son has tuberculosis.

8. A man, aged 34. Large perforation. Sister died of tuberculosis. Has extensive involvement of right lung.

9. A man aged 44. A perfectly round perforation. Mother died of tuberculosis. Anemia of mucous surfaces.

10. A man, aged 36. Small perforation. Father died from a "protracted pneumonia." This patient was seen in 1897. He died early this spring as his brother states from a general wasting, a slight cough, and ulceration of the rectum—tuberculosis.

11. A young woman. Case one described in development of ulcer. Parents died of tuberculosis.

The six cases of simple perforation in which there was no clinical history of tuberculosis are as follows:

12. Young woman. Case described in development as number two. Perfect family history.

13. Young woman, aged 30. Small well-cicatrized perforation. Ascribed the ulceration to typhoid fever.
14. A young woman, aged 24. Oval perforation with cicatrized borders. Atrophic rhinitis.
15. A young woman, aged 35 (?). Large perforation, well-developed, well-nourished woman. Atrophic rhinitis.
16. A married woman, aged 46. Large perforation. Perfectly straight septum. This perforation is said to have been produced traumatically during the introduction of a feeding tube through the nose while an inmate of an institution. The patient was being treated for hysterical mania. A maternal aunt died of tuberculosis. This is too remote to be classed with above cases.
17. A man, aged 65. A large perforation with cicatrized edges. Perforation said to have been noted immediately after recovery from typhoid fever.

The remaining 8 cases which make up the set of twenty-five, which have formed the basis for this study, are all of the syphilitic variety. They all had clear syphilitic histories, as well as the characteristic local evidences of syphilitic perforation, in that they involved not only the cartilaginous but also the osseous septum. In two of these cases as now observed, with perfectly cicatrized borders involving apparently only the cartilaginous septum, one would be constrained to believe them simple perforations; yet in both of these cases, at an earlier stage, when they first came under my observation, there was osseous necrosis in the floor of the nose, and from each there were small sequestra removed before the healing process was assured, and both on careful investigation gave characteristic constitutional evidences of infection. The five remaining cases present nothing of interest except that they evidenced the extensive destruction that usually attends syphilitic involvement of the septum.

An analysis of the twenty-five cases above mentioned, shows eight to have been due to a local change through the degenerative metamorphosis of a characteristic lesion of a known constitutional disease. In a proportionate ratio of 30 per cent. of the seventeen remaining cases, without clearly defined etiologic agency, we have eleven in which there was a positive indication of tuberculosis or the

tubercular diathesis, and six without this evidence, showing a proportionate ratio of about 68 per cent. of these as having a history with tuberculosis more or less in evidence. The remaining six of this latter class gave as etiologic factors atrophic rhinitis in two cases, typhoid fever in two, and negative in two.

This large preponderance of perforation of the cartilaginous septum in persons affected with tuberculosis or with strong tubercular histories, is as Hajek states, in commenting on the extreme frequency of the finding of so many perforations on the cadaver in tuberculous individuals, more than a simple coincidence. To me it seems as though the process is one that is predisposed by impaired nutritive action in the mucous membrane covering the cartilaginous septum as well as in the cartilage itself, such nutritive change being induced by diseases which impair the general nutritive activity by their ataxic type, as typhus, typhoid, and kindred diseases, or by tuberculosis and the tubercular diathesis. Tuberculosis and the tubercular diathesis, as is well known, impress upon various tissues and organs of the body such alteration in their nutritive processes that when the proper stimulus is applied, they lead to degenerative changes which may or may not show the characteristic histologic elements of tuberculosis.

We all frequently observe during our routine work the various changes which have been described by Voltolini, Zuckerkandl, Weigert and Hajek as affecting the mucous membrane of the septum, many of which endure for years without change, many heal, and a few ulcerate with destructive perforation of the septum. That the greater percentage of cases show no lethal activity in the mucous membrane or cartilage of the septum is, I think, due to the fact that the nutritive activity in the cartilage and mucosa is normal; when this is abnormally lowered, due largely to the predisposing conditions above mentioned, we have the lethal changes resulting.

II.

A CASE OF ISOLATED, UNILATERAL, LATENT
EMPYEMA OF THE SPHENOIDAL SINUS WITH
DELIRIUM AND MENTAL SYMPTOMS.
OPERATION. RECOVERY.

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I have been thus explicit in the title of this paper as I desire to give prominence to those features in the report of a case which render it instructive, an attribute which can not usually be predicted of rare cases. The symptoms of disease in one sinus are, usually, except in the case of the maxillary sinus, and often also there, masked by concomitant disease of other sinuses or of the nasal chambers. This has done much to prevent the possibility of a differential diagnosis in the localization of sinus disease, a matter of the very greatest importance to the rhinologist. The aid offered by this case in the elucidation of these points would alone justify the report of the case, but, as will be seen, there are other points of interest presented by it which will excuse intrusion of its report here.

Sphenoidal sinus disease is half as frequent as that of the antrum of Highmore. It usually exists without especial symptoms. If the os is patent the cavity drains well, and the symptoms of post-nasal catarrh may or may not attract the attention of the patient. In either event the sinus condition is almost invariably overlooked by the physician, experienced though he may be in the diseases of the nose and throat. This applies more especially to chronic catarrhal conditions. Acute inflammation of the sphenoidal sinus is frequently present with a like condition in the other sinuses. These are common enough we know in the coryza associated with influenza, and with pus in the nose the general diagnosis of sinusitis is not difficult, while its specific localization is often very diffi-

cult. The majority of the acute cases recover without especial treatment, beyond that directed toward the amelioration of the symptoms of a cold in the head. An involvement of the sphenoidal sinus in the chronic suppuration of one or more of the other sinuses is not infrequent. An isolated suppuration is less common, and when the purulent accumulation does not find vent into the nasal fossa, it is needless to say its presence is usually overlooked and only discovered, if at all, at autopsy, death having resulted from that cause, or more commonly from some other affection. I need not here go into a reference to the literature of the subject of which, as well as my own experience, the foregoing is a summary.

Dr. X., aet. 57, married and doing a large nose and throat practice, came to my office for the first time on Nov. 30, 1901. His speech was low and his manner dazed. He said he was desperate. The pain in his head was unendurable. In speaking he would raise his left hand to the vertex of the head toward the occiput and bring it down to his left eye and below, which gesture, often repeated, localized the pain better than he could describe it. As well as could be ascertained at the time, the patient's previous history was not so significant, nor could, on more favorable opportunity, any evidence of disease of any kind be elicited, prior to an attack of the grip in the middle of January, 1901. This was accompanied by a severe coryza and a pain of the same character from which he was now suffering. After a few weeks of ordinary treatment the symptoms all subsided.

In July he had an attack of the same very severe pain. This he attributed, in the absence of any nasal symptoms, to the influence of the heat and his exposure to the sun. It lasted for some weeks. He was then somewhat forgetful, irritable and emotional. In August, during a trip to Nova Scotia, he was entirely free of all symptoms. In September he was again seized with pain of the same character. It gradually became atrocious, unendurable and of a heavy, bursting, boring character, not sharply localized in his description of it, but his hand continually making the excursion over the left side of his head I have described. There was great hyperesthesia of the scalp. He stated that he was frequently seized with severe attacks

of sneezing after which he had some relief, but I could get no history of any nasal discharge.*

These attacks of sneezing would sometimes be followed by a short period of relief. He said that others had noted a foul smell on his breath. This I have subsequently learned was first noticed in September. It was now markedly present. It was not the smell of dead bone or of ozena, but with the diagnosis partly formed, I surmised it to be of the character of retained decomposing secretions.

At times during the early morning hours he was fairly comfortable, but after 11 o'clock the pain became severe again, subsiding somewhat at night. There was considerable daily variation in the severity of the pain, but on the whole it became worse from week to week until I saw him. Dr. Joel W. Hyde, under whose care he had been, urged him to seek a rhinologist, and he had consulted a very distinguished confrere, who he said had assured him he had no nasal trouble, but advised him to go away again for his health. Dr. William Browning had seen him several times, and had examined him carefully, and believed, as he afterwards told me, there was no intra-cranial trouble. Singular to say, the patient had gained ten pounds in weight since February. This was the history elicited in a somewhat confused shape at my first interview, and has been subsequently straightened out a little.

On examination, the nasal mucosa, except for some congestion, was healthy and clean, and there was no especial obstruction to be seen either anteriorly or posteriorly. The introduction of a cotton-tipped probe caused severe pain, not especially localized, in either nostril. No other evidence was elicited by the probe. The middle turbinated bones, while apparently normal, left a very narrow slit in the nose, through which inspection of the ethmoidal or sphenoidal region was very unsatisfactory. Posteriorly a good view of the region was obtained in the rhinoscopic mirror, but nothing especially significant could be noted. Transillumination of the frontal and maxillary sinus gave bright spots over these regions. The patient's tem-

*I questioned him closely as to this but could elicit nothing, but since his recovery I have learned from him that sometimes during these attacks of sneezing he would blow or spit out what he supposed was a semisolid mucosity, of moderate size.

perature was subnormal and his pulse was slow. I could discover no other evidence than that here detailed of intracranial mischief, but I was strongly impressed with the possibility of its existence. I was, however, more convinced that the patient had pus under pressure in the left sphenoidal sinus, and perhaps in the posterior ethmoidal cells. This I advanced to the patient as a tentative diagnosis. I advised him to use adrenalin spray followed by a hot nasal douche directed toward the suspected spot, to keep a morning noon and night record of his temperature, and to return to me in four days.

On the morning of that day I received a note from his wife telling me he was unable to come. He had been confined to his bed for twenty-four hours and had been delirious. In consultation with Dr. Hyde, Dr. Browning and Dr. A. T. Bristow, I saw him at noon. He was then somewhat stupid, having had bromids, and his mind wandering in slight delirium occasionally, but he was capable of answering questions rationally. The pain was intense, and the adrenalin spray and the hot douches had only intensified it without bringing any discharge of pus. His mental condition had prevented him from keeping a record of temperature. Since I had seen him he had treated patients, but some of his prescriptions had been returned from the druggist as improper. Just before we saw him he had spat up a foul-smelling, cheesy mass from his nasopharynx. I immediately examined his nose and nasopharynx again, but I could discover no sign of pus following the extrusion of the mass, nor indeed any other abnormality. From the fact that no pus had followed the semi-solid mass I was inclined to think the trouble in the sinus might be a malignant growth. On careful examination it seemed to most of the gentlemen who examined him there was some proptosis of the left eye, but this was a matter of doubt. Dr. L. A. W. Alleman examined the fundus with the ophthalmoscope. With the exception of some slight congestion in the left eye the picture was normal, as was the vision.* Dr. J. M. Van Cott examined his blood

*An ophthalmoscopic examination of the patient after recovery throws some light on the question of meningeal or cerebral involvement. I, therefore, append a letter from Dr. Allen recently received, which, it seems to me, argues the existence at the time of

and found the leucocytes normal in amount. An examination of the urine showed a normal specific gravity and an absence of albumin. As the patient's condition showed no improvement it was decided to make an effort to explore the sinus. The next morning (Dec. 5) he was transferred to the King's County Hospital. His condition precluded the idea of operation under cocaine and illumination of the parts, while if necessary to open the posterior ethmoidal cells an external incision would be necessary. In the afternoon he was etherized.

I had the choice of intra-nasal operation or a supra-orbital incision by which to make the attempt to perforate through a healthy frontal sinus and the anterior ethmoidal cells, with a doubtful prospect of striking pus in the posterior ethmoidal cells, and the probability of being unable to establish proper drainage into the nasal chambers from the sphenoidal cavity. Moreover, the subsequent syringing of the cavity would be difficult without the removal of the middle turbinated bodies and a perforation in a line with the anterior nares. On the other hand a perforation through the nose, while attended with some uncertainty as to the sphenoidal sinus, was too risky a performance on

operation of some sort of intra-cranial lesion, which subsided after the evacuation of the sinus. The character of the lesion I am not prepared to determine.

DEAR DOCTOR:—On my first examination of Dr. X., made the day before you operated, I experienced some difficulty owing to his mental condition, and the bad lighting. In my examination of the fundus I could, however, satisfy myself that no gross lesion was present, but that the whole retinal picture was hazy, and disc margin blurred, and a low grade neuro-retinitis probably present. Pupillary reaction was normal and motility unaffected.

From an examination made on Jan. 16, '02, I am convinced that he was at that time suffering from a neuro-retinitis, which evidently increased subsequent to the first examination. The nerve in the right eye is covered with a faint haze; and, on the nasal side of the disc there is pronounced blurring and the retinal vessels rise sharply and bend over this indistinct area. The left eye also suggests a previous inflammation and the nerve is decidedly blanched on the temporal side.

An examination of Feb. 4, '02, shows an improvement of the retinal picture, and field carefully taken on the perimeter shows no limitation. The bilateral affection of nerve suggests to me a central origin.

Very truly yours,

Dictated

L. A. W. ALLEMAN.

the posterior ethmoidal cells without the guidance of vision. Nevertheless this was the route which I decided upon, as I was sure the trouble had its seat in the sphenoid wherever else it might be, and there might be time for a subsequent supraorbital incision, if necessary. With the valued assistance and advice of Dr. Bristow and Dr. Arrowsmith, and the house staff of the hospital, the palate was drawn forcibly forward by a tape through the nose. The tip ends of the middle turbinated bones could be felt through the naso-pharynx. The finger of an assistant was kept as high in this situation as possible, the gouge end of Bryan's ethmoidal curette was introduced through the left nostril between the middle turbinate and the septum, until it rested on the assistant's finger in the choana and impinged on a solid wall. The end was then raised a little above the finger and a boring motion was imparted to the instrument. Quickly soft bone was felt through the mucosa. Very little force was necessary to perforate this and the instrument entered a cavity. Pus was seen then to be present far back in the anterior nares. The instrument, after as large an opening was made as I dared to attempt, was withdrawn and in the groove of the gouge for 1/2-3/4 inches was seen the cheesy, dark, foul-smelling secretion, similar to what he had spat out the day before. The odor, however, was masked by the ether and the carbolized solutions. As it was not at all certain that the other sphenoidal sinus was healthy, it also was opened in a similar manner, without difficulty, but no pus followed, nor was there any evidence of thick secretion in the groove of the instrument. The distance from the alae of the nose to the firm posterior wall of the sinus was 3 1/2 inches. This corresponding to the distance which I had determined by repeated measurements in the cadaver.* I was certain that the instrument was in the sphenoidal cavity. In that direction any distance exceeding three inches is sure to lead into the sphenoidal sinus, if a cavity is entered.

An attempt was now made to remove the middle turbinated bones. The usual anterior incision with scissors proved impossible on account of the lack of room and the absence of illumination. A snare failed to engage the

* Twentieth Century Practice, Vol. VI.

bone. A septal spokeshave, invented by Chappell for the removal of cartilaginous spurs, with a quadrilateral perforation long enough to engage the whole of the middle turbinate, was introduced into the nostril, and adapted as well as possible by the assistant's finger in the nasopharynx over the turbinate. It was then forcibly removed from the nose, bringing with it all the soft parts and a portion of the bone. The sinus was again sounded and found easily accessible. The middle turbinate of the other side was also removed. The nasal cavities prior to the operation had been thoroughly sprayed with adrenalin, and all these procedures were attended with very slight bleeding, no secondary hemorrhage resulting.

The patient stood the operation well, but three hours subsequently he had a chill and a temperature of 104.5°F. By morning it had fallen to below 100°, and the pulse correspondingly. It was noted on the day following the operation that the slight proptosis on the left side had disappeared. No complications arose from perforation of the right sphenoidal sinus.

One or two pieces of foul smelling, cheesy matter came from the nose, but these were small, and no more appeared after three or four days. The nasal cavities were irrigated thrice daily and the sinus on the left side washed out through a female catheter once daily. The amount of pus removed was insignificant and drainage seemed perfect.

The patient was immediately relieved of all his former pain and the odor disappeared entirely from his breath. For the first three days his mental condition improved but the delirium, perhaps never entirely absent, became more marked. It was of a mild, muttering, wandering character gradually increasing until it was necessary to restrain him to keep him in bed. The temperature did not go above 100° and was frequently subnormal, the pulse of good quality, ranging below 80°. He took abundance of nourishment and his bowels were moved by cathartics. Dr. Browning, who saw him from time to time, ascribed the delirium to sepsis. As there was no somnolence nor decided evidence of cerebral involvement, nor meningeal inflammation, it was thought possible there might be a collection of pus in the posterior ethmoidal cells. The delir-

ium increasing, the patient was again etherized on December 12th, one week after the first operation. A curved incision was made through the lower part of the left eyebrow, the skin being raised on the supraorbital ridge. It extended from the middle of the latter well down on to the glabella. An elliptical flap was turned down, the periosteum raised, the healthy frontal sinus exposed by removal of a small button of bone with a hand trephine. The posterior wall of the infundibulum was perforated, and a passage was forced with the gouge end of Bryan's curette through the anterior and posterior ethmoidal cells and into the sphenoidal cavity, the posterior wall of which seemed to be reached at a distance of about $3\frac{1}{4}$ inches from the glabella. No pus nor dead bone was encountered, the route of the instrument being seemingly through healthy cell tissue. Care was taken, of course, in breaking through the thin lamellae to keep the point of the instrument directed away from the cranial cavity. Beyond the front of the anterior ethmoidal cells vision was impossible. The track of the gouge was thoroughly syringed out. It was impossible to break a way from the posterior cavities into the nose without inflicting dangerous laceration on healthy structure, but a way was forced into the nasal fossa through the anterior ethmoidal cell. Through this a strip of iodoform gauze was inserted from the external incision into the nostril, bringing it out anteriorly.

I am free to confess that at this second operation, meeting with no more pus in the ethmoid, I believed that the patient had an intra-cranial lesion of some kind, and I gave his friends an unfavorable prognosis, which opinion indeed I had entertained to a considerable extent from the first, believing it probable that intra-cranial mischief had already started when I saw him.

With this Dr Browning did not agree, insisting that if there was trouble within the cranial cavity it was of a congestive character, favoring the idea, however, that delirium was due to sepsis. The patient had a chill after the second operation and a temperature of 102.5° in a few hours. This subsided, however, and never subsequently went above 100° , except on one occasion when it rose to $101\frac{1}{2}^{\circ}$.

The delirium however continued for nearly ten days, but gradually diminishing. The drain was removed from the

external incision at the end of thirty-six hours, the track was syringed out for two or three days, but by the end of a week the incision had practically healed, there being for a day or two a little inflammation of the edges which caused the rise of temperature spoken of. The stitches were removed at the end of a week and no complications ensued from the second operation. Gradually the delirium subsided. At the end of a week there was a decided change for the better in his mental condition, though somewhat forgetful and unable to pursue a train of thought persistently. At the end of ten days he was entirely rational and was removed to his home, the pulse and temperature becoming normal. His sleep and appetite, which indeed had at no time been persistently bad, were excellent.

He was then able to sit in a chair and with a good illumination the sphenoidal region was inspected. Some fragments of tissue hid the ostium but a probe passed by these readily and freely into the sphenoidal cavity, and I was assured that the irrigation through the catheter, followed out without illumination in his delirium, had been thorough and effectual. Small fragments of sanguinous mucus, such as we are accustomed to see in the maxillary sinus, could be freely washed from the sphenoidal cavity daily. Bits of the mucosa being removed with the snare, a perforation, at the normal site of the ostium, into the sphenoidal sinus could be seen. This still shows no tendency to contract. No pus of consequence can be detected, but a good deal of the mucus from the sinus drops into the nose, which is easily kept clean by means of the anterior nasal douche.

I am still unable to say whether the delirium was due to a slight sepsis which did not markedly affect the temperature, or whether it was due to cerebral congestion; I am inclined to believe in the latter hypothesis.

January 8, 1902, at the time of this writing, a very small amount of muco-pus is washed daily from the sphenoidal ostium, which can be plainly seen. The patient appears very well, but he says that prolonged mental exertion still tires him. The improvement in his mental condition has been marked in the last week. He now walks and drives in the open air daily.

The lesions drawn from this case are obvious.

The peculiar agonizing, bursting, boring character of the

pain, referred to the vertex chiefly, though radiating in other directions, in any case in which other sinuses are evidently involved, points to retained secretion within the unyielding walls of the sphenoidal cavity.

This need not be an absolutely continuous pain, because we may readily imagine an intermittency in the pressure. Such a case from anatomic relation is especially apt to develop cerebral symptoms. The result in this case is evidence that those symptoms do not necessarily indicate an uncontrollable lesion, and are not by any means, however grave they may be, contra-indications for operation. On the contrary a basilar meningitis is not absolutely beyond the hope of amelioration from such a procedure. In any event, a case of more advanced meningeal trouble or a cerebral abscess can not be made any worse, and the operation is indicated on the chance of a mistake in the gravity of the diagnosis.

The presence of pus in the nose is not necessary to a diagnosis of sphenoidal disease. The history and especially the character of the pain and the foul odor of the breath, I think, fully warranted the diagnosis, while the expectoration of the foul cheesy mass, it seemed to me, made the diagnosis very positive. While disease of the posterior ethmoidal cells could not be excluded, especially in the presence of the proptosis, the absence of pus or polypi in the nose led me to suspect they might be unaffected. A suppuration so extensive as to involve the posterior ethmoidal cells would be much more liable to give rise to edema of the nasal mucosa and allow the trickling of pus than an abscess walled in by the thick bone of the sphenoid.

As for the operation, under the circumstances it was hazardous and uncertain, chiefly however because of the variation in the site and extent of the sphenoidal cavity. Nevertheless, I believe that the plan pursued was the proper one. The chances of perforating the body of the sphenoid are slight when the gouge enters by the anterior nares and is guided to some extent by the finger in the nose pharynx, provided no senseless violence is used. If the cavity, however, is not entered at a depth of $3\frac{1}{2}$ inches, further attempts in that direction had best be abandoned, or indeed before that depth is reached, if the distance to the anterior wall measures less than three inches; the external incision should then be resorted to and the whole line of cells opened up.

III

SUPERHEATED COMPRESSED AIR IN THE THERAPEUTICS OF CHRONIC CATARRHAL OTITIS MEDIA.

GEORGE W. HOPKINS, M. D.,

CLEVELAND, O.

While engaged in conducting extensive experiments to determine the efficacy of superheated dry air in the treatment of obstinate joint affections, some five years ago, it occurred to the writer that this most important agency might be of some value in the treatment of those obstinate cases of chronic catarrhal otitis media which are characterized by ankylosis of the ossicles. With a view to determining the capabilities of the treatment in this direction, several typical cases were selected, the diagnosis in each instance being confirmed by colleagues of reputation as aurists, and suitable heating devices for their treatment constructed.

The first case subjected to treatment is of especial interest at this time as it illustrates, in a measure, the possibilities of treatment even with the crude heater, employed at that time, and also because it has had the best test of time, having been discharged about five years ago.

The patient, John L., aged fifty-three, a carpenter, with excellent family and personal history, has never been seriously ill, but has had nasal catarrh for fifteen years and gradually increasing deafness for ten years.

Examination revealed a typical case of hypertrophic rhinitis. The watch tick could be faintly heard with the watch in very close contact with the left ear. The tick could be heard to a distance of three inches from the right ear. The left ear was selected for the test.

Diagnosis: Chronic catarrhal otitis media, with sclerosis and displacement of the tympanum, ankylosis of the ossicles, slight dilation of the Eustachian tube, and some labyrinthine involvement.

The diagnosis was confirmed by two colleagues of reputation as aurists, before treatment was instituted. Regular, systematic treatment, continued for two years before this experiment was made, had scarcely stayed the progress of the disease.

Treatment: The ear was thoroughly cleansed with alcohol for several days before treatment was instituted. The patient was then seated in a comfortable chair, the ear examined and found perfectly clean. Narrow strips of dry gauze were packed into the ear and a large pad of dry gauze placed over the ear. The ear was then covered with the canvass-sleeve hot-air conductor, and a current of air sent into the canal at a temperature which gradually attained 400° F.

The temperature was easily borne, if gradually increased until a high point was reached; the only discomfort attending the treatment arising from a severe headache which followed it, but which was promptly relieved by a dose of codein.

Following the hot air treatment, the Eustachian tube was always inflated with a warm stimulating vapor from a globe nebulizer, vibratory massage with the nebulizer completing the treatment.

The patient was not allowed to leave the office for a half hour after treatment and the ear was tightly packed with warm cotton before he went out.

The nose and pharynx received appropriate treatment with antiseptic washes, etc.

Treatments were continued on alternate days for three months, at the end of which time he could hear the watch tick distinctly at thirty-four inches, and surprised his friends by invariably replying to their whispered references to him.

The right ear was then similarly treated, and in ten weeks an equally good result was secured.

Examination showed that the ears were normal in appearance. The patient was discharged January 6, 1897, and careful tests made at frequent intervals since have shown no tendency to recurrence.

As to the philosophy of such a cure by this agency little can be said at this time, but it seems certain that the intense heat stimulates the circulation through the blood

supply on the posterior side of the manubrium, causing absorption of the articular deposits; removing atrophy and relieving the rigidity of the tensor tympani. The ossicles lie so near the surface that they receive the full benefit of heat applied to the tympanum, and adhesions between portions of the ossicular chain and the adjoining bony walls of the middle ear are readily removed.

Naturally, much better results are secured in the same period of time in hypertrophic cases than in those characterized by hyperplasia; but many cases of the latter type, which would ordinarily have been regarded as hopeless, have gradually improved under this treatment until marked benefit was secured.

Apparatus: An ordinary gas room heater was fitted up with a funnel top and a canvas sleeve which conducted the heat to the ear under treatment.

For four years following this trial the writer pursued similar experiments on a number of cases—sixty-two in all—and had but four absolute failures—all of them occurring in old people who had extensive labyrinthine involvement.

But while these results were exceedingly gratifying, there were several serious and annoying obstacles to the successful employment of the treatment which have only recently been entirely overcome.

The chief obstacle has always been the fact that it was difficult to introduce superheated air into a cavity like the ear, which would not permit the free passage of a current of hot air to its blind end—the membranum tympani—where the heat was most needed.

Before the desired temperature could be secured at the tympanum the heat would become unbearable on the auricle.

Most of the heat was, of necessity, wasted, and any hot air which reached the tympanum merely reached it accidentally, so to speak.

The natural obstacle in this direction was increased in magnitude by the necessity for packing the canal with gauze to prevent burning. Nor could these obstacles be overcome by employing a different heater from the prevailing type.

All of the heaters now manufactured, to the knowledge

of the author, are of the "natural draft" type, in which most of the heat must, of necessity, be wasted, in order

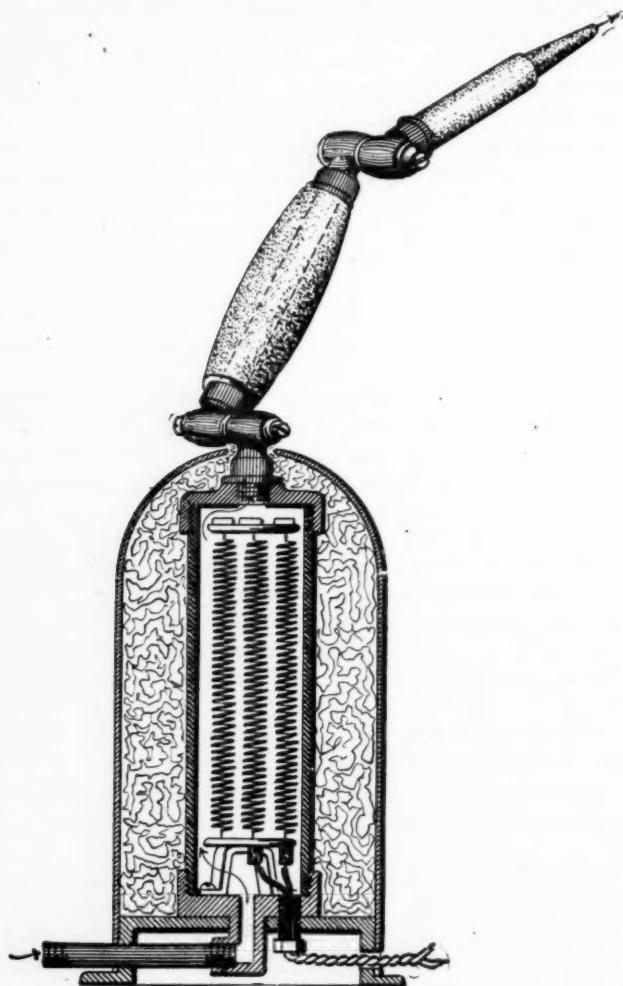


Fig. 1.

to secure perfect combustion, and if any attempt be made to drive the heat through any resistance, such as a closed cavity, like the ear affords, the heat will immediately

travel in a volume through paths of less resistance—the draft holes.

Consequently we are powerless to direct the heat where we would, at will.

This obstacle may be overcome, in a small way, by perforating the 'sleeve,' or conductor, freely near its distal end, but, at best, even this constitutes a very crude form of treatment.

Nevertheless, despite these readily apparent disadvantages, the old appliances and old methods have

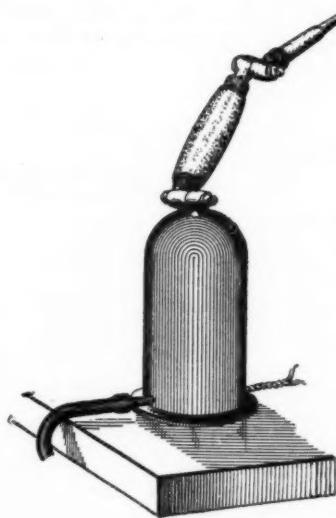


Fig. 1.

yielded such splendid results as were never attainable by other agencies.

A far better way has been found, however, and it is made available by a heater recently constructed for the author, along entirely different lines, by The Ferry Heater Co., of Cincinnati.

This heater has been made for me in three types, as illustrated, deriving their heat, respectively, from alcohol, gas and electricity, the choice of instruments depending upon convenience.

The heater in its various types derives its superiority

from the fact that it heats compressed air and delivers it to the patient, under pressure, at the desired point only, and it cannot escape at any other point.

The alcohol heater (fig. 1) consists of a metal cone around the inside of which is wound a tapering coil of copper tubing. Beneath it is an alcohol lamp which heats the coil to a high temperature in a few minutes.

Compressed air from a tank, pump or bulb enters the heating coil at the bottom, through rubber tubing, and leaves it at the top through a metallic tube having an ear-tip of vulcanized fiber, shaped similarly to an ear speculum.

The delivering tube has two rotating joints which make it readily adaptable to any position of the patient, and the

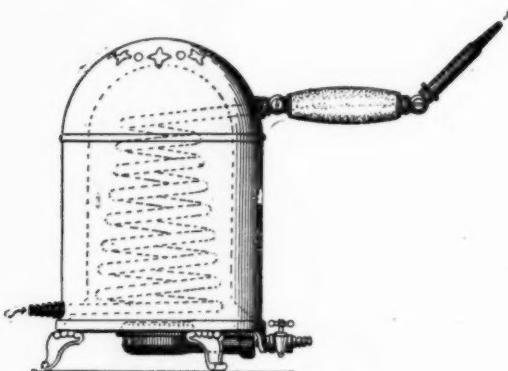


Fig. 2.

vulcanized fiber ear-tip does not become inconveniently hot, even when the hottest air is passing through it.

This heater is far superior to those of the old type, but has a much smaller capacity than either the gas or electric heater of the new type.

The gas heater (fig. 2) consists of a blue-flame heater over which is set a similar, but larger coil of copper tubing. The compressed air enters and leaves the coil in the same manner. It has a large capacity, is economical in cost of operation, and gives splendid results.

The electric heater (fig. 3) is the ideal appliance of this ideal type. It takes the current from the 110-volt lighting circuit through an ordinary lighting-socket and plug, and

can be used on either the direct or alternating current.

It consists of an air-tight tube, holding within it the wire heating-coil. A nickel-plated hood surrounds it, and the intervening space is packed with asbestos.

The wires enter the tube at the bottom through a bushing, and as the tube is perfectly air-tight it serves the purpose of a coil of copper tubing and makes the latter unnecessary.

Compressed air enters the tube at the bottom and leaves at the top in a manner similar to the other heaters of this type. Air passing through this appliance acquires its maximum temperature in eight minutes—a rate of elevation which is just about right—and the heater is an ideal one in every respect.

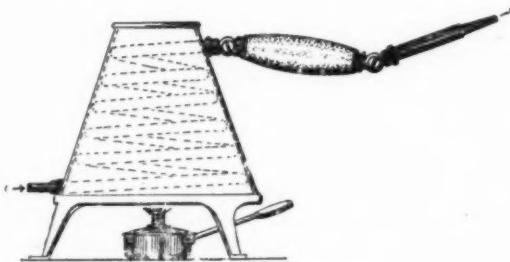


Fig. 3.

With either the gas or electric apparatus an enormous volume and degree of heat can be secured at will.

The results secured by employing a heater of this type are incomparably better than the good results secured from heaters of the old and crude type.

Heaters of the new type have a direct, definite and positive action. They embody safety and convenience in every detail and yield certain and prompt results because the compressed air which they heat must escape, with more or less force, at the exact spot desired and cannot escape at any other point.

So great is this advantage that compressed air heaters will perhaps ultimately entirely replace the old "natural draft" heaters.

Several seemingly peculiar facts must be borne in mind in employing compressed air heaters:

(1) When the appliance becomes hot and exit is through a small opening, as in an ear-tip, the temperature of the air is proportional to the rate of flow, or degree of air pressure. Strange as it may seem, the air temperature may be increased one hundred degrees by increasing the air pressure five pounds, or conversely, the temperature may be decreased by lowering the pressure. This fact enables us to regulate the temperature at will by merely increasing or decreasing the volume of air entering the cylinder.

(2) The air temperature drops very rapidly after the air leaves the exit-nozzle and in order to secure the maximum heat the part under treatment must be as near the nozzle as possible and still allow room for escape of the used air if a cavity like the ear is under treatment.

As to the results which may reasonably be expected from the judicious and skillful employment of this agency with good appliances in cases of chronic catarrhal otitis media, it may be said:

(1) That as an exclusive treatment it is rarely of much value in bad cases.

(2) That when indicated and judiciously employed, in conjunction with other measures of recognized value, it will give results which would be utterly impossible without its aid.

(3) That when employed with care it is absolutely safe unless contraindicated.

(4) That it is of little value in old subjects who have extensive labyrinthine involvement.

(5) That it stimulates absorption of articular deposits, removes atrophy and relieves rigidity of the tensor tympani.

(6) That it acts more favorably on the ossicular chain than on many other articulations, because of their exceptional proximity to the surface.

(7) That arteriosclerosis, serous effusions into the tympanum and perforations of the tympanum are usually contraindications, and always contraindications to the inexperienced operator.

Technique: The ear selected for treatment is carefully examined and found to be perfectly clean and dry. A light pad of gauze (two thicknesses) is placed over the ear

and with an ear speculum the gauze is pressed deeply into the canal. The ear-tip of the heater is then carried well into the canal, leaving only room enough between the tip and the tympanum for the escape of the used air.

The electricity is then turned on, or the gas ignited (as the case may be) and the compressed air is admitted to the cylinder under about five pounds pressure. It is well to give a ten or fifteen-minute seance, increasing the temperature gradually until the limit of toleration is reached. The temperature steadily increases until the heater reaches its generating limit at that air-pressure, and if the patient tolerates the temperature well it may be further increased by raising the air pressure to seven, eight or even ten pounds, in most cases. One cannot be guided by thermometers in giving these treatments and hence they are not employed on the new heater described. The only guide which can safely be followed is the individual toleration of the patient. But it is well to remember that the more slowly the temperature is raised the higher temperature the patient can endure without discomfort.

Treatments are best given three times a week for from three to twelve months.

Every case must be treated as a whole. He who neglects the appropriate treatment of the naso-pharynx is doomed to disappointment.

Antiseptic washes must be used. All abnormal conditions must be rationally treated. Constitutional measures, when indicated, must not be neglected. Inflation of the Eustachian tube with a warm, stimulating vapor from some good apparatus like the Globe nebulizer is usually imperative.

It is well to practice Eustachian inflation and vibratory massage of the middle ear with medicated vapor from the nebulizer after each hot air treatment, being particular that the vapor is warm. A warm vapor is easily secured by connecting the compressed air heater in service with the nebulizer, sending the compressed air first through the heater and then through the nebulizer.

Careful attention to all details brings most gratifying success in the form of gradually and steadily improved hearing and gradual disappearance of tinnitus.

A single detail neglected may cause absolute failure.

1016 New England Bldg.

IV.

THE RECORDING OF EAR CASES.

BY B. ALEX. RANDALL, M. A., M. D.,

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It is much to be regretted that the matter of ear-records is still in such a chaotic and unsettled condition, and that excellent as are some of the schemes presented, they still offer much cumbersome fulness or other elements of unavailability which greatly limit any extensive use. That of Rohrer is wonderfully complete in most of the details which it suggests for record, yet lacks several of those points which to me seem clearly essential; and while the graphic method of Hartmann is excellent so far as it goes, still its usefulness has narrow limitations. Case-books in prepared form have been devised by numerous authors, but their value in some cases is offset by inappropriateness to many others; and a waste of space and awkward suggestion of incompleteness results from such hard-and-fast methods. Yet for the adequate study of most of our cases, many details must be systematically worked out and recorded; and if our results are ever to be made fairly comparable a more uniform notation must be devised of a simplicity and yet completeness, that will commend it to a wide circle of otologists. Any prepared page, which undertakes to offer blanks for *all* details, is really impracticable to more than the very limited circle of users. Therefore, a ready scheme of noting on the blank page with fair system and condensed fulness those details which are essential to the case in hand seems far preferable.

Having used for a decade or more a scheme of this sort which I find corresponds closely to that of Gradenigo and

others, it seems fair to offer it as one having some at least of those elements of simplicity and flexibility which may lead to its wider adoption. On the blank page of my case-book the name and age of my patient occupy the first line, with space for the major diagnosis. The second line gives the date, the residence, the occupation, and the family physician, with room for any secondary diagnosis. The third and fourth lines are given to the tests of hearing, which can be compressed simply yet clearly into thus little space. A fifth and as many sequent lines as are needful can give the history, and then two lines for right and left give the otoscopic findings. The eighth line then records the nasal and pharyngeal condition, and the details of treatment can come below. The record compressed within these lines needs usually but moderate expansion on further occasions to fill out any gaps and to keep it complete with the further history of the case.

Of the details here given, a small fraction only have been prearranged in any of the set forms and the need to have these ready-prepared as a time-saver or reminder should not be great. Much must depend upon the completeness and exactness of application of the points recorded in this limited space; and abbreviations to meet individual fancy must of course be used in order to thus compress them. Yet it is, I believe, sufficient to enter these data in the method which I employ to enable any other aurist to make readily comparable study-records, and I find it perfectly feasible to note, at any time of treatment, changes in the degree or character of the results with fair precision and facility.

The record of the third or fourth lines therefore, with the tests of hearing, is the central part of the scheme and begins with the note of hearing for the voice, faint whisper, stage whisper, conversational or loud voice, as the case may be, tested generally by the cardinal numbers up to thirty spoken with the "reserve air" remaining in the lungs after ordinary tidal expiration. Knowing that a stage-whisper should be heard some fifty feet, dependent in the individual case principally upon the room and the choice of the higher and lower pitched words, we are able to gather a vague but most practical impression as to the hearing in these directions.

Following this come the tests with the tuning-forks; and while in this I frequently employ from the lowest to the highest commonly in use, I consider four as covering the essential ground and being but little supplemented by others. The tuning fork of fifty double vibrations per second is a most real test of the early phases of obstructive deafness. Not heard by many with little but prodromal symptoms, its audibility to many perfectly deaf for high tones through nerve-lesion renders its pointings of great differential value. The fork of 25 double vibrations is really heard in its fundamental tone by few, if any ears; that of one hundred vibrations is unheard by few, unless extremely deaf, whatever the seat and character of the lesion; the fork of one thousand vibrations can be heard by many wholly unable to hear that of two thousand vibrations and lacks, therefore, much of the value as a test for percipient lesions which is furnished by the higher-toned fork. Tests higher than this are little used except in the form of the Galton whistle, because the Koenig's rods or the high forks are not generally available; but the convenient little whistle is of much value if it be of standard construction as are too few of those offered for sale. Its range should be from about 4000 to upward of 40000 double vibrations per second, as its obturator is screwed up from the tenth to the first turn marked on its scale.

In determining with the fork the measure of the hearing, the duration of the tone or the distance at which it is heard (for these two are strictly comparable) is to be noted after a blow which shall be as regular in standardization as possible. To this end nothing is better than the plan of standing a fork on end upon the thigh and letting it fall of its own weight through its own height to strike the muscle cushion above the knee. Each fork will then give a tone of fairly uniform strength dependent upon its own weight and height, and if these differ in the instruments as furnished us by the dealers we need only make record of such dimensions in order to have the basis of our comparison.

As determined from normal ears the figures found, whether for distance or for duration, constitute the denominators of fractions of which the findings in the individual cases furnish the numerators. These placed in the lines of

our record for right and left ear respectively, after the number or symbol of the fork employed, give us a ready and concise record. The symbol of a given fork or tone is so indeterminate in various nomenclatures (c. standing sometimes for a fork as low as 128 double vibrations per second, or of the next octave or even the second octave above, up to 540 double vibrations per second) that the record of the vibrations made has a definiteness which surpasses the convenience of the briefer symbol. Schwabach's method of recording the result of each fork both as to air and bone-conduction means the expenditure of an undue amount of time, but we can generally accomplish all that is needful by making this comparison for those forks only which the other elements of the case prove to be more distinctive; while the more simple Rinné's test or Roosa's still simpler "louder back or front?" furnishes the same information in a practicable amount of time.

In practice the test for air-conduction may best precede that for bone-conduction; and the Rinné's test made before the Weber test will often secure from the astonished patient the acknowledgment that he hears better in the worse ear, which he may have supposed was wholly devoid of hearing and would probably not have believed had not the previous test borne in the conviction upon him. Politzer's test with the tuning-fork vibrating before the nostrils where it should be heard louder in the instant of swallowing, is a test of greatest value as determining the physiologic patency of the Eustachian tubes, and should never be omitted. The watch and acoumeter have seemed to me of too little value to be worth the time consumed in employing them; but the data above given may be supplemented by them as well as by the Bing, Gelle or other tests where they seem of probable value. The point of greatest importance seems to me, that within 10 minutes one can make and record all those tests which seem essential to the comprehension and presentation of the case. It is because of this simplicity, efficiency and flexibility, I would commend some such method of examination and scheme of record as worthy of wider trial if not of general acceptance.

EXAMPLE.

No. 2,797, Mrs. John Smith, aged 27 12.10.01. 1810 Walnut Street. (Dr. Wm. Brown.)	O. m. c.c; incip. left. Cerumen impaction, right.
A. D. Loud whisper 1 m. A = 25 d.v.s. 0cm.; A = 50 1 cm.; A = 100 5 cm.; A = 200 10 cm.; e = 500 20 cm.; e ¹ = 1000 10 cm.; e ² = 2000 10cm.; Galton 100 - 8; Be > Ac; Pol. -; Weber right	
A. S. Faint whisper .50 A = 25 2/5; A = 50 5/10; A = 100 10/15; A = 200 25/40; e = 500 35/40; e ¹ = 1000 35/25; e ² = 2000 20/20; Galton 100 - 8; Bc. = Ac; Pol. +	
Hearing waning 2/3 years, espec. on right; hissing nearly constant; "dropping in throat."	
Otosc. A.D. Cerumen plug-syringed; walls fair; Mt. dull and depressed; mobility poor; little change by catheter.	
A. S. Canal free; Mt. depressed; fair mobility; improved by inflation; catheterization freer than right.	
Nares narrowed anteriorly left; post-nares thickened; mucus in right tube-mouth and on granular back wall.	

V.

SALIENT POINTS IN THE TREATMENT OF SYPHILITIC LESIONS OF THE NOSE AND THROAT.

BY CAROLUS M. COBB, M.D.,

BOSTON, MASS.

Notwithstanding the amount of study which has been given to syphilitic lesions, there is still a great diversity of opinion in regard to treatment. There is, of course, no question of the value of iodid of potash and mercury in dealing with this disease, but the question is in what form, and in how large doses, and for how long a time shall they be given. The disease runs such a protracted course and varies so much in individual cases, that it naturally leads to this difference of opinion.

A physician may enjoy a large practice for many years without seeing a severe type of the disease, and such a one is very prone to think that the disease is particularly amenable to treatment or that his method of treatment is more efficacious than the method usually employed, but if the same physician is unfortunate enough to have under his care one of those types of the disease in which one region of the body after another is involved he will be ready to accept the statement of those who claim that syphilis is never cured.

Whether it is or not we will not now discuss, but certainly the local lesions which are easily reached and can be directly treated can be cured, and I remember to have heard Jonathan Hutchinson argue in one of his lectures that he had the same right to expect cure in those lesions which could not be seen and reached, as he had in the external lesions. For the most part the rhinologist has to do with lesions which can be seen and therefore directly treated. Primary disease of the nose and throat is exceedingly rare and I remember to have seen but two cases, in an experience covering a period of eighteen years. One of these

was a chancre of the lower lip from kissing and the other a chancre of the tongue, the method in which it was acquired not stated.

The rhinologist is called upon to treat the secondary and tertiary stages of the disease and it is therefore his skill in the management of these that will be of benefit to his patients, and perhaps the experience gained in treating lesions which can be seen may not be useless to the general practitioner.

In the treatment of syphilitic lesions of the nose and throat we should not only use vigorous constitutional measures, but should also make applications to the lesions where ever possible. In regard to the constitutional treatment the question arises, in what doses and for how long shall the patient be treated? The destructive character of these lesions in the nose and throat often demands that medication be pushed to the limit of toleration. And this must often be done quickly if we hope to save further deformity. To accomplish this it is often necessary to give a patient from 150 to 300 grains of iodids in the 24 hours and to continue this for many days. If the case is hard to control one-fourth grain doses of the protoidid of mercury should be given three or four times a day. Hutchinson claims that patients are more readily brought under the influence of mercurials if they take prolonged hot baths, and it is well to bear this in mind when dealing with cases which do not yield readily to treatment.

Patients differ greatly in their susceptibility to the influence of anti-syphilitic medication, and this should be given due consideration. Again, the stomach is likely to become irritable with large doses of iodids. This can be in a measure overcome by giving them largely diluted with water and after meals, and sometimes by the addition of elixir of pepsin. If the mercurials disturb the digestion they may be given by inunction or by subcutaneous injection. The principal point in the general treatment, especially if the case is at all urgent, is to reach the point of toleration for the individual patient and to continue near that point for some time.

The local treatment of these lesions is of the utmost importance and consists not only in the removal of all necrotic tissues as fast as possible, but also in the local ap-

plication of antisyphilitic medication. We have also in syphilitic lesions of the nose and throat, to take account of infection by other bacteria, so that we have added to the syphilitic disease a suppurative condition. So far as my observation goes, syphilitic infection is not a pus-producing disease, and is not accompanied by suppuration in locations which are not easily accessible to infection by other bacteria. Tissues infected by syphilis furnish good ground for other bacteria and this is especially noticeable in cases where the nasal chambers are involved.

This infection by other bacteria is very much favored by the accumulation of necrotic tissue, and for this reason all necrosis of bone or soft tissue should be removed as soon as possible and mild antiseptics should be freely used. Antiseptics containing mercury are better, as we then get in addition the local effect of the mercurial. The effect of the local application of some form of mercury is of the greatest benefit to these cases, and it is my practice to dust calomel over the lesion after as thorough cleansing as possible and to order mercurial ointment rubbed into the skin as near to the lesion as possible. If the ulceration has broken through upon the surface, I have the patient apply a plaster of mercurial ointment directly to the ulcerated surface and wear it constantly, until healing has taken place. By these local applications we render these lesions as readily amenable to cure as external syphilitic ulcerations in other parts of the body and these are well known to be the most successfully treated of all syphilitic lesions. I wish to call attention to the following conclusions:

First, that internal medication should be pushed to the limit of toleration for the individual case.

Secondly, that prolonged hot baths are of use in bringing the patient quickly under the influence of antisyphilitic medication.

Thirdly, that in syphilitic lesions of the nose and throat we have infection by other bacteria, and must therefore use antiseptics freely.

Fourthly, that the local use of mercurials renders these lesions as amenable to treatment as external syphilitic ulcerations in other parts of the body.

VI.

TREATMENT OF LARYNGEAL TUBERCULOSIS.*

BY J. PRICE CAMPBELL BROWN, M. D.

TORONTO.

As laryngeal tuberculosis, in a vast majority of instances, is secondary to pulmonary tuberculosis, the systemic treatment is practically the same in each. Hence this branch of the subject having already been thoroughly discussed, I shall confine my remarks to topical treatment, together with a few words upon general, diatetic and climatic considerations, specially bearing upon the throat.

First of all, the voice should be spared as much as possible. Sudden changes of temperature should also be avoided as well as dusty or irritating atmosphere. The use of tobacco should under any circumstances be limited. Alcohol, when taken at all, should be freely diluted, and rendered bland, to avoid the irritation which it otherwise might produce, in the hyper-sensitive mucous membrane.

In reference to diet, it is well known that in this disease deglutition is often very painful, and in advanced cases, sometimes almost impossible.

Hence, when irritation exists, all food should be demulcent, or of a soft character, and of a temperature suitable to the palate of each individual case.

When ulceration exists, and the tissues are partially necrotic or destroyed, fluids are often difficult to swallow, the tendency for them to enter the imperfectly protected larynx being constantly present. To obviate this tendency semisolids or thick demulcent liquids should be given. The latter are best taken in gulps, like raw unbeaten eggs. Freudenthal has materially lessened the odynphagia and dysphagia in these cases, by the free daily administration of large doses of olive oil; the benefit being the result of

*Read before the Toronto Medical Society in a discussion upon Tuberculosis, November, 1901.

the continuous lubrication of the diseased mucosa—the swallowing being made easier.

Lake has obtained excellent results in these cases by adopting a modification of the German dish, "Bifsteck a la Tartare." Two ounces of raw beef, free from fat and gristle, are put through a mincing machine, and then intimately mixed with the yolk of an egg. In the worst cases of dysphagia, this preparation can often be taken.

Wolfenden has adopted a special method of overcoming this laryngeal difficulty with marked success. He instructs his patient to lie on a couch with the face downward over the end, the hips being elevated by resting on the knees. The patient then sucks the fluid from a tumbler through a rubber tube. By this means swallowing can be accomplished—the force of gravitation keeping the food out of the larynx.

In many cases a change of climate for patients suffering from tuberculosis is neither desirable nor possible; but when decided upon, the condition of the larynx and upper air passages should have an important bearing in the selection of the health resort. I laid a great deal of stress upon this point in a paper which I had the honor of reading before this society eight or nine years ago; and later experience has only confirmed the view then expressed.

As a general rule, it may be laid down that when the laryngeal tuberculosis is purely secondary to pulmonary disease, other things being equal, an elevated region of several thousand feet above the sea offers the best conditions for the arrest of the tuberculosis, owing to the rarity, dryness and purity of the air, and the stimulus which these give to fuller and deeper respiration.

On the other hand, when the tuberculosis has been preceded by laryngeal catarrh, and the disease has first proclaimed itself by hoarseness or soreness in the larynx, an atrophic condition of the upper air passages is often indicated. In such cases, change to an elevated, dry, rarefied air can only do injury; while a sojourn in a favorable climate down by the sea, or a prolonged ocean voyage in properly selected cases, may be of highest benefit.

There are six different conditions which the tuberculous process may assume in the larynx: namely, anemia, hy-

peremia, infiltration, ulceration, necrosis, and the presence of new formations or growths. It is necessary to mention these, as the treatment varies somewhat according to the form in which the disease presents itself. Several of these conditions may be present in the one case at the same time.

In anemia the peculiar feature occurs, that while the mucosa of the arytenoids, ventricular bands and epiglottis may be pallid, the vocal cords are usually congested. In this condition, and when infiltration is commencing, the best results, in my own experience, have been obtained by spray treatment.

If the nose and pharynx are in an unhealthy condition, these should first be cleansed. Then an alkaline spray downward, through a curved instrument, will cause the expulsion of the mucus from the trachea and larynx. The second spray, to be used immediately afterward, should consist of an antiseptic volatile stimulant, dissolved in a bland aseptic medium. For the former, menthol, thymol, creosote, guaiacol, are among the most valuable; and for the latter any of the pure hydrocarbon oils, such as albolene, glycolene, petrolene, etc. Of these preparations I have found none so uniformly satisfactory for constant use as menthol in albolene of from one to five per cent. in strength. The immediate subjective effect is a sensation of heat in the larynx, followed by one of coolness and comfort. The objective or observant effect is that the pallid parts are cleansed and vivified, having become more or less pink in color; while the reddened vocal cords have become whiter and less congested, owing to the freer circulation throughout the larynx induced by the treatment. It is reasonable to believe, that if this effect can be produced once or several times a day in a weakened and diseased throat, the result should be beneficial.

Other methods of treatment recommended by authors are steam inhalations, medicated by oil of pine, eucalyptus, compound tincture of benzoin, creosote, menthol, etc., etc.; and to give ease during the process of inhalation, a few drops of chloroform are sometimes added.

In hyperemia we have a condition which occurs much more frequently in tuberculosis of the larynx than is generally supposed. The idea that the laryngeal mucosa in

this disease is invariably pale is a mistake, being only approximately true. As Lake says: "There is a great difference between the larynx of a case of chronic phthisis and one of laryngitis tuberculosa in a phthisical patient. In the latter the efforts of coughing and the irritation of the pathologic process will in the majority of instances have set up considerable redness." To this might be added the fact that in acute miliary tuberculosis of the larynx, whether primary or secondary, there is usually considerable congestion.

The treatment in these cases is similar to that required in the anemic condition, with the exception that the sprays or insufflations used after the first cleansing treatment, should not be of quite so stimulating a character.

In infiltration or tumefaction, the methods of treatment advocated by different laryngologists vary greatly. Many laryngologists believe that until ulceration has occurred, operative treatment is never required, save for the relief of acute or chronic stenosis; while with others, operations of one sort or other are constantly being done.

Shurly has long advocated that linear incisions into the infiltrated tissue, in selected cases, are highly beneficial. They relieve the tension and do what nature herself would do at a later date; at the same time enabling the operator to directly medicate the diseased parts. In this he is supported by Bronner and other writers.

Lake strongly advocates the removal of interarytenoid thickening with cutting forceps; as he puts it "in almost every case." To use his own words, "in no class of case is the effect of thorough operation more satisfactory than in uncomplicated interarytenoid thickenings or vegetations." He also uses the electro-cautery wire to amputate the whole of the infiltrated epiglottis.

Gougenheim extirpates the arytenoid cartilages, for infiltration of the commissure, with punch forceps; under the belief that the primary cause is perichondritis or necrosis—a severe method of treatment which few laryngologists will be inclined to follow.

For these infiltrations, Chappell by a special instrument makes submucous injections of creosote, menthol, and oil of wintergreen in castor oil, from which he claims to have had excellent results. Donelan likewise has had recov-

eries through the agency of interstitial injections. He inserts a one minim dose of pure guaiacol into the most prominent part of the swelling; and like Chappell repeats the injection at intervals of about a week.

In ulceration, there appears for many years back to have been a general consensus of opinion in favor of the local application of lactic acid, notwithstanding the severe pain which its application produces. The advice is given to first apply a solution of cocaine to the larynx; and then to rub into the ulcer by means of a laryngeal cotton carrier, lactic acid, commencing with a dilution of say 10 per cent.; and gradually increasing the strength from time to time until 80 or 100 per cent. can be borne by the patient. When applied in this way to the ulcerated surface, the pain frequently lasts for many hours. Freudenthal says often from ten to twenty; and is so terrible that the patients dread the treatment and will frequently resort to all sorts of excuses to avoid its repetition.

In my own experience the use of lactic acid in these cases has not been so adverse. This may possibly be owing to a different method of application. I have never used a weaker solution than 25 per cent., and usually the first application has been 50 per cent. instead, increasing from that up to acid of full strength. But then I have always considered it unadvisable to use friction. The method has been first to spray the larynx with a one per cent. solution of cocaine. Then to apply directly on a cotton carrier a three to five per cent. solution, soaking the ulcerated surface pretty freely. Next a cotton pledget fairly saturated in the lactic acid solution is pressed gently upon the ulceration—but without any friction whatever—the patient being instructed to breathe gently and regularly while the application lasts. By this means the lacticated cotton can be kept in contact with the diseased surface for many seconds without producing either laryngeal spasm or pain.

The difficulty that I have unfortunately experienced, when attempting friction, is that the sensitive organ, although cocainized, rebelled. Spasm was produced; and by the contraction of the intralaryngeal muscles, the fluid was squeezed out of the cotton sponge, and forced downward between the vocal cords and into the trachea. Not

only so, but the friction of the acid upon the ulcerated surface seemed to aggravate and prolong the suffering without being counterbalanced by any adequate good.

When applied in the way suggested, the saturation point being limited, a stronger solution can be used; thus compensating for any supposed advantage, derived from the friction by a weaker drug.

Of course, as in the treatment of the other conditions already described, the larynx and trachea should be cleansed before applying the cocaine by the free use of an antiseptic alkaline spray.

Lennox Browne recommends the application of a 20 per cent. solution of menthol in olive oil.

Freudenthal has found a menthol-orthoform emulsion of his own device of great benefit in these cases, and free from the pain-producing effect of the lactic acid. In this preparation the orthoform has a fixed ratio of $12\frac{1}{2}$ per cent. while the menthol varies from 1 to 15 per cent. according to the condition and requirements of the patient. He applies the emulsion by injection, using as a prior application, a powder of saccharated suprarenal gland for its anesthetic effects—thus doing away with the necessity of using cocaine.

In my own experience, what might be called "progressive use of menthol," has been very beneficial in checking the ulcerative process and reducing infiltration in laryngeal tuberculosis. The anesthetic effect of weak solutions of menthol upon the mucous membranes of the pharynx and larynx is well known. This occurs, although in a minor degree when using cocaine, without producing the depressing effect incident to the use of the latter drug.

Hence, after cleansing the larynx with an alkaline spray, I throw into it freely with the down curve of an atomizer a 1 per cent. solution of menthol in albolene. This is followed in two or three minutes by a 5 per cent. solution; and if deemed advisable, after an equal interval, by a 10 per cent. or even stronger. The remarkable thing is that the patient will frequently affirm that the last spray of menthol in albolene, although ten times as strong as the first, does not hurt nearly so much.

Intralaryngeal insufflations of powders, such as iodoform, aristol, europhen, dermatol, pyotanin, etc., etc., have frequently been used, but they have not met with very wide favor; as from their drying dessicating character, they produce little but discomfort for the patient. They may check the discharge of pathologic secretions and hinder elimination.

It is to Krause and Herryng that we are indebted for the use of the curette in the treatment of tubercular ulceration of the larynx. Under cocaine anesthesia, the ulcers are operated upon either with the single or double instrument, the entire ulcer being cut away if possible. This is not, as a rule, attended by much hemorrhage. The application of a solution of adrenalin prior to operation will make the bleeding even less. The rule has been, upon checking the hemorrhage, to apply the diluted lactic acid to the raw surface, the latter to be repeated from time to time during the process of healing. In many cases, by this method of treatment, the progress of the laryngeal disease is checked, and in some cured.

Still many laryngologists consider the method too heroic, and too questionable of ultimate good to be practiced except in rare cases. Bryson Delavan has expressed himself on the whole as in favor of milder measures; and Lennox-Brown, speaking of the combined curetttement and use of lactic acid says: "But the cases must, I think, be rare in which the treatment would be justified by the result."

Gleitsman advises galvano-cautery operations upon the infiltrated posterior commissure, when dyspnea and odynophagia are well marked. I have personally had several opportunities of endorsing his experience upon this point. One advantage of this method of operation over curetttement and excision by cutting forceps, etc., is, that when properly performed, it does away with all possibility of auto-infection. The main points are, 1st, to insure a perfect attitude of stillness of the larynx while operating, and 2nd, to accurately gauge the extent of the burning incision. The second is but a corollary of the first. The larynx should be thoroughly cocainized, and then during the operation the patient's undivided attention should be devoted to uninterrupted and regular breathing.

Scheppegrell advocates the use of electrolysis or "cupric interstitial cataphoresis" for the disintegration of the tubercular deposit; and has invented a laryngeal electrode to promote the absorption of remedial agents into the diseased tissues.

Necrosis may attack any of the cartilages of the larynx; and frequently the epiglottis is the chief seat of sloughing. Fortunately, however, this condition is rarely attended by severe hemorrhage. The tubercular nodules are non-vascular, and being surrounded by epithelial cells, imbedded in a zone of granulation tissue, and this itself surrounded by small-cell infiltration, it can readily be seen that the likelihood of severe hemorrhage is limited. The consequence is that in necrotic conditions, spray treatment to cleanse the diseased surfaces and stimulate to a better blood supply (together with scraping away the dead tissue) is about all that can be done apart from anodyne applications to relieve pain. The advisability of scraping itself is still an open question.

When deglutition is very painful, sprays of cocaine or eucain, or the two combined are called for. The latter produces less nausea than the former; and the limit of saturation of eucain being 5 per cent. in aqueous solution, it will probably be the safer one to use.

Further range of surgical measures is somewhat limited. Papillomatous growths, the result of progressive ulceration, may require removal by evulsion, snares, or escharotics, especially when they occur about the vocal cords or ventricular bands. Occasionally they form without ulceration, and assume the shape of ordinary papillomata with sessile base. These, when interfering with respiration or phonation, should be removed.

Intubation can scarcely be of any use in laryngeal tuberculosis, as the stenosis is almost always above the vocal cords, upon which the flange of the tube is supposed to rest.

Tracheotomy, too, can rarely be advisable; perhaps only for the relief of impending suffocation; and there are few instances on record in which it has even then prolonged life for more than a few days or weeks.

There is one other method of treatment that I have reserved to the last, inasmuch as it applies as well to pulmon-

ary as laryngeal tuberculosis. I refer to the administration of intratracheal injections. In many of the most recent works on laryngology, such as those of Lennox Brown, Kyle, Shurly, Bishop, Price-Brown, etc., if mentioned at all, it is only in the most incidental manner. There have, however, during the present year, been two excellent monographs written upon the subject, the one by Thompson of Cincinnati, and the other by Anderson of Detroit. Lake, too, in his new and excellent work on laryngeal phthisis quoted very favorably of it; and gives an illustration of his own intratracheal syringe devised for administering the injections required. Another surgeon, by the name of Thompson in 1852, and Bing in 1865, are both reported to have used intratracheal injections with the expectation of curing pulmonary tuberculosis in this way—failing in the effort, the treatment fell at once into disuse. Later it was revived again, and Downie wrote in the *British Medical Journal* favorably upon it nine years ago.

For some months now I have used intratracheal injections for chronic laryngitis and laryngeal pulmonary tuberculosis in a number of cases with promising results, although it is too soon to place any proper estimate upon the value of the new method of treatment.

The early injections were chiefly aqueous solutions, with the addition of glycerine; and although good results were reported, it was not until oil was substituted for the water, that the full beneficial results began to be realized, the oleaginous applications being so much less irritating. Of the various oils that have been used, none seem to suit the conditions so well, as the purified hydrocarbons, extracted from crude petroleum. Besides the essential qualifications of blandness and softness, these possess the additional advantage of not being culture mediums.

The most effective medicines for use by the intratracheal method are the same that are used for stimulating sprays, stereoptenes like menthol and thymol, and methyl-ethers like creosote and guaiacol; substances that are soluble in oils and that will volatilize slowly at the temperature of the body, the vapor from them reaching not only the larynx but all parts of the lungs as well. The strength of the solutions should be from one-half to two per cent.

The writers mentioned claim that from 4 to 8 cubic centimetres of the menthol-camphor solution of one or two per cent. strength, can be injected into the larynx without producing irritation—the larynx being bathed with it and the whole bronchial tree medicated at the same time. The solution is felt by the patient in the bronchial tubes, and the odor can be detected in the breath of the patient for hours afterward. In the latter lies one of the essential benefits of the treatment; as in the act of expiration the vaporized drug is brought in direct contact with the diseased laryngeal tissues.

One of the immediate results of the treatment is a warm pleasant glow felt throughout the lungs, and extending over the entire body, even to the hands and feet. Another is the rapid cessation of cough, the larynx feeling soothed and comfortable, the sensation lasting in some cases for hours.

Menthol may be used of the strength of one to two per cent; thymol half to one per cent. guaiacol one per cent. creosote one per cent.

A stronger solution of either of the latter would produce pain. Chlorophenol may be used in small doses, say 1 c. c. of one per cent. Of any of the others, the dose might be from 4 to 8 c. c.'s repeated once a day.

Lake is the only one of the writers mentioned who has referred to the matter of temperature. I may say, however, that in every instance that I have used this method, following his suggestion, I have first heated the instrument in warm water; and then filled it with the oil at blood temperature. By the use of the laryngoscope, the tip of the instrument was then guided over the epiglottis, and the patient instructed to inhale slowly while the stream was poured into the larynx. Up to the present I have confined my own treatment in this line to the injection of one to two per cent. of menthol in albolene, the amount injected varying from 4 to 8 c. c. repeated every one or two days.

It is worthy of note that when thus given, and without using cocaine at all, the patients could scarcely feel the entrance of the fluid; but toward the latter part of the inhalation the contact of the oil within the bronchial tube would produce a slight cough, though only of short duration.

So far, every patient that I have treated in this way, whether suffering from chronic bronchitis or tuberculosis, has expressed satisfaction with the new method of treatment.

VII.

A YEAR'S EXPERIENCE IN THE TREATMENT OF
THE EUSTACHIAN TUBE BY MEANS
OF THE ELECTRO-BOUGIE.*

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No contribution in recent years to the treatment of catarrhal disease of the middle ear has excited greater interest and offered more promise of success than that proposed by Duel in a paper read before this society in Cincinnati in 1899, entitled The Value of Electrolytic Dilatation of the Eustachian Tubes in Chronic Tubal Catarrh and Chronic Catarrhal Otitis Media. Since this original paper by Duel, many aurists in different parts of the country have been testing the value of electrolysis, and papers have appeared by Kenefick, Brandegee, and others. Any method of true merit welcomes the fullest investigation. With an idea of further testing the value of this method, the writer has devoted most of his time in the ear department of the Manhattan Eye and Ear Hospital for the past year to the application of electrolysis to suitable cases. The subject has been approached without bias and in an entirely impartial spirit. This work was rendered possible by and at the suggestion of Dr. Wendell C. Phillips, who afforded every courtesy and opportunity for making these investigations in his clinic. Out of over 75 cases referred, some 33 were regarded as suitable. These, with the two exceptions to be noted, all showed the presence of stricture in one or

*Read at the seventh annual meeting of the American Laryngological, Rhinological and Otological Society, held in New York on May 24, 1901.

both tubes. Each case was carefully tested with acou-meter and tuning fork at the beginning of treatment; many had previously received a full course of treatment by means of the catheter. So far as possible, the technique as practiced by Duel was followed out. A Wappler machine was employed in connection with the street current. In a majority of the cases a silver catheter wound with thin rubber was used; later on a hard rubber catheter was substituted. Care to sterilize all instruments was continually exercised. A current of not more than three milliamperes was the rule—in every instance, the sign of "bubbling in the ear" was sought for—and no increase in the strength of the current was made after that point was reached. As little force as possible in advancing the bougie was employed. Inflation after bougieing was always avoided. The negative current was employed for a period not exceeding five minutes. In each instance, with the exceptions to be noted, the bougie was caused to enter the tympanum. The bougies were the graded old bougies made by Ford.

Among the questions sought to be answered were:

(a) The value of electrolysis as compared with other methods of treatment in the relief of tinnitus due to middle-ear catarrh.

(b) Its relative value in improving the hearing.

(c) How permanently the structure is relieved.

(d) What dangers, if any, lie in its use.

(e) What is the true nature of the process or phenomenon taking place.

In the 33 cases treated, 26 had tinnitus of a chronic nature (no acute cases). Of these 26

1 was cured.

13 were improved.

12 were not improved.

—
26

Seventeen of the 33 complained only of hard hearing. Of these

12 were improved.

5 were not improved.

—
17

No. of Case	Age	Sex	Tinnitus	Tuning forks C IV. C.	Whispered voice	Acoumeter	Situation of stricture	No. of times boughled	Whispered voice last test	Acoumeter last test	Tinnitus	Length of observation	Condition of tubes
1 28	F.	Yes	A. C. 0 10 B. C. 25 15	— 8" — 6" — 20"	8" 6" 20"	8" 15'	1 in	8	20"	20"	Imp. no ch.	3 m. 4 mns.	open
2 22	F.	No	0 12 — 17 2	— 12 — 2	— 6" — 20"	— 20"	1 in	9	45"	6"	no ch.	"	
3 38	F.	Yes	24 12 — 13 5	— 12 — 5	— 15'	— 15'	3/4 in	4			"	2 1/2 mns.	stricture reformed
4 23	F.	Yes	0 8 — 8 3	— 8 — 3	— 2'	— 2'	3/4 in	4			"	2 mns.	open
5 31	M.	Yes	25 10 — 8 7	— 10 — 7	— 30"	— 30"	mouth and larynx	7			"	2 mns.	"
6 27	M.	No	10 7 — 14 0	— 7 — 0	— 20"	— 20"	1 in	4		30"	no ch.	2 mns.	admit bougie but much swollen
7 21	F.	No	10 20 — 25 10	— 20 — 10	— 15"	— 15"	1 in	10	6"			1 yr.	
8 24	M.	Yes	17 18 — 30	— 18 — 30	— 20" — 5'	— 20" — 5'	1 in	6		6"	Imp.	6 m.	open
9 30	M.	Yes	10 5 — 17 7	— 5 — 7	— 30" — 20"	— 30" — 20"	1 in	10	4"		but does not think he hears better	6 m.	
10 20	M.	Yes	10 3 — 5 9	— 3 — 9	— 1"	— 1"	mouth and 1/2 inch	8	1 1/2"		no ch.	3 m.	Tinnitus ceased for a time, tubes very much swollen
11 40	F.	Yes	0 8 — 12 0	— 8 — 0			1 in	3			"	5 wks.	
12 24	F.	No			3"		1 in	4	3"			5 wks.	open
13 18	F.	Yes	10 15 — 15	— 15	— 15"	— 15"	1 in	4	15"		gone	2 mns.	narrow
14 33	F.	No	12 15 — 15	— 15	— 30"	— 30"	1 in	5		30"	no ch.	3 mns.	stuffed up hearing gone
15 69	F.	Yes	01 6 — 10 0	— 6 — 0	— 20"	— 20"	none	1	20"		no ch.		open
16 26	F.	Yes			30" 30'	30' 30'	1 in	6	30"	30'	Imp.	3 mns.	adhesion at mouth
17 49	F.	Yes	25 5 — 10 0	— 5 — 0	4'	4'	1 in	3		4'	"	1 mn.	open

That is to say, as regards tinnitus, 55 per cent. were cured or relieved, and as regards hearing 72 per cent. This can be compared with Duel's results of 42 cases of tinnitus, where 38, or 90 per cent. were relieved in whole or in part. An analysis of the 13 cases of tinnitus reported above as improved is in order, inasmuch as improvement may be much or little, temporary or permanent:

Case 1—After three months of treatment, reports tinnitus lessened in degree, but still persisting. No previous treatment.

Case 2—Three months under treatment. Much relief to tinnitus, which at times ceases. Much previous treatment.

Cases 3, 9 and 10—Some improvement.

Case 4—Three treatments; no decided improvement, but patient was relieved.

Case 5—Relief to tinnitus, but it was not permanent; stricture dissolved.

Case 6—Decided benefit. No other treatment availed; but no stricture present.

Case 7—Considerable improvement, but stricture never passed. Three months of weekly treatments.

Case 8—Tinnitus lessened, but persisting; character changed.

Case 11—Tinnitus lessened, but persisting; character changed.

Case 12—Immediate and marked improvement. No previous use of celluloid bougie.

Case 13. Two treatments only. A slight improvement followed, but the patient disappeared from observation.

In brief, of these 13 cases reported as improved,

2 were much relieved,

9 were partially relieved,

1 was much relieved, but no stricture was present,

1 was only temporarily relieved.

Of the two cases reported as cured, one disappeared after the second treatment, and no subsequent report could be obtained from either until recently, when the second patient returned at the end of four months and reported the tinnitus as bad as ever.

We can then with certainty point to only 2 cases out of 25, where strictures were present, in which permanent and marked relief to the tinnitus was experienced.

A further analysis of the 12 cases where there was no improvement shows that all were classed as mixed or sclerotic (combined involvement of middle and internal ear).

Strictures were encountered in every instance and successfully passed, except in two cases. In one case electrolysis caused an increase of the tinnitus.

A similar study of the 12 cases where improvement in the hearing was noted, reveals three in which the improvement was only slight—about three inches; in 3, the gain was from six inches to three feet for the whispered voice; while in the remaining six the improvement was noteworthy—four feet to twelve feet. In short, real benefit to hearing was made in 8 of the 17 cases, or in a little less than half. Later examination of two cases shows all improvement lost.

Two patients who complained only of a sense of fulness in the ears—one of them after much previous treatment by the catheter—were slightly relieved. One case of persistent non-inflammatory pain in ear, resisting all other treatment, was much benefitted.

An important question is how permanently the strictures are relieved. Here my experience is at variance with Duel's. In many instances, after thoroughly opening the tube and passing the stricture into the tympanum, at our next electrical treatment, although the ears had been carefully inflated in the mean time, a reforming of the obstruction was met with. This was particularly true in Case 7, where, after two months' absence, the work had to be done over again. This patient never made the same improvement after the second course of treatment, gaining at first fifteen feet, and later only from four to six feet. We are convinced, too, that the electric current is capable, even when properly used and within moderate limits of strengths, of causing adhesions in the tube. One instance of this was particularly well demonstrated. It was the case previously referred to as presenting catarrhal pain in the ear. Several strictures were encountered and passed, with much relief to pain. The "bubbling" symptom was met with only at current strengths of from 4 to 5 milliampères. At an interval of a month, electrolysis was again tried, but all attempts to introduce the bougie failed. It was an unusually favorable case to see that the catheter was in the

No. of case	Age	Sex	Tinnitus	Tuning Forks C. IV C.	Whispered voice	Acometer	Situation of stricture	No. of times boughed	Whispered voice last test	Acometer last test	Tinnitus	Length of observation	Condition of tubes
18 31	M.	Yes					1 in	1		worse	1 mn.	open	
19 32	F.	Yes	A. C. 3 3 B. C. 7		1-2"	1"	1 in	4	1"	improved	7 wks.	"	
20 32	M.		17 0 8 0		1"	1"	1 in	6	1"	no change though at times better	2 mns.	"	
21 60	M.	Yes	10 7 17 0		0	none	6	2"	improved	2 mns.	"		
22 19	F.	Yes	0 20		7"	1 in	5			"	2 mns.	stricture not passed	
23 49	M.	Yes	0 5 15 0		0	1½ in	6	0	"	2 mns.	open		
24 46	F.	Yes	3 5 20 0		3"	1 in	6	36"	no change	1 mn.	narrow and stricture reformed		
25 39	M.	Yes					1½ in	1		slightly improved		open	
26 22	F.	Yes	0 5 10 3		0	1 in	2	1"	no change	3 mns.	"		
27 32	F.	Yes	0 4 10 0		0	2' and ¾		6 4"	4'	improved	2 mns.	stricture reformed	
28 23	F.	Yes	10 7 19 5	12"	2"	1 in	9	10"	3"	"	10 wks.	open	
29 28	M.	Yes	10 15 17 6			½ in	3	2'	"		3 wks.	"	
30 47	M.	No	18 9 10 0	15' 15"	15'	1 in	3	15'	15"	pressure gone	3 wks.	"	
31 22	M.	No	0 0 25 0		0	none	3	0			2 mns.	"	
32 25	F.	Yes	0 10 10 0					2		improved	1 mn.	"	
33 40	M.	Yes	10 8 0 4		8'	1 in	3			no change	1 mn.	"	

right position, for there was a marked cleft palate admitting of direct inspection, and revealing adhesions directly at the pharyngeal mouth.

In this connection it may be said that, in our experience, bubbling is not always a reliable sign. In many instances it will be noticed by the patient at 1, 2, or 3 milliampères. In other cases, 5, 6, or 7 milliampères have to be reached. Several times the patients reported a similar bubbling after removal of the bougie, and in at least three cases no bubbling was ever secured; only increased tinnitus or pain, such pain always evidencing the cautery effect of the current. Care was exercised in each case to secure as thorough asepsis as possible. In spite of this, suppuration of the ear followed in four cases. In three of these cases the recovery was rapid, ten days to two weeks, and was unattended by any unpleasant sequelæ, not even reducing the hearing for a long time. The fourth case deserves to be reported at greater length.

The patient was a young lady, twenty years of age, who presented herself for hard hearing. An operation for adenoids and septal exostosis was performed. This was followed by an attack of grippe, confining her to bed. This seemed to be a relapse from a previous attack just before she entered the hospital, not known about at that time. Upon what appeared full recovery, electrolysis was applied to the tube opposite to the side of the nasal operation. A slight stricture was encountered and passed at $1\frac{7}{16}$ inches. Improvement in hearing was noted, with no unpleasant results. The following week the bougie was again introduced. This time no stricture was met, but at exactly $1\frac{1}{2}$ inch, as was carefully ascertained after removal, a distinct snap was heard both by the patient and myself, followed by severe pain. Examination showed that Shrapnell's membrane was much reddened. The pain disappeared for three hours, then returned with much severity. I saw the case on the day following or at the end of twenty-four hours, found a bulging drum, and performed a paracentesis. Examination of the discharge showed many streptococci. No pain over mastoid. The day following, pain developed in the mastoid and five days from the electrical treatment I opened the mastoid, and found pus. The recovery was uneventful and no permanent loss of hearing was sustained.

Here, clearly, there was a short Eustachian tube. One and a half inch meant a forcible tenotomy of the tensor tympani, or possibly a luxation at the incustapedial joint. It is questionable if even this could cause all the disturbance which followed without the presence of bacteria. These could have been introduced by means of the catheter or bougie, in spite of the care which was exercised. As these had been properly sterilized it is possible that bacteria were already present in the ear as a result of the grippe, and that the traumatism served thus as an exciting factor. This case is full of significance. We feel that it is time to sound a warning note against the widespread use of the method on the ground of its entire freedom from danger. Recently we have heard of still another complication. In two cases, in the hands of an experienced, competent man, the bougie has broken off *in situ*.

We may conclude:

1. That the assumption that the length of the Eustachian tube is 1 1/2 inch in all cases, is an unsafe rule to follow, and that, beyond 1 1/4 inch the greatest care is to be exercised as to its further introduction. We are told that we learn when we have entered the tympanum by the touch gained by experience, but this experience may be gained at too great a cost.
2. That too scrupulous care in the way of antisepsis cannot be exercised. The experience of Duel was that force in advancing the bougie was not necessary; this has not coincided with ours. In many cases, it is true that mere contact of the bougie caused a dissolving of the stricture. In others a considerable amount of pressure needed to be employed. To know just how much force to use in a given case is often a delicate matter. The liability to cause a false passage is constantly to be borne in mind. This has actually occurred in the experience of several of my confrères. In two cases it was impossible after repeated efforts—and using as much current and force as seemed warranted—to pass the obstruction. It gave the sensation of a wall of bone.

The nature of the process is full of interest. In our mind there seems considerable question whether it is truly an electrolytic process. It seems scarcely possible to believe that a fibrous mass of years' duration can be dissolved in

thirty seconds, as is often the time in which a stricture gives way, by a two-milliampère current exerting its influence, not merely on the end of the bougie, but also over its sides. It is not an infrequent experience to find that a stricture which has been originally passed could not be passed at the second sitting, but at the third sitting no difficulty in passing it was encountered.

Following the suggestion made by Dr. J. F. McKernon at a recent meeting of the Section in Otology of the New York Academy of Medicine, several cases of dilated tubes were subjected to the treatment. In one case only was there decided benefit to tinnitus and hearing. Here, a reflex action on the auditory nerve was probable.

A still weightier question is the true nature of the obstruction we meet with, which we commonly designate a stricture. Does there really exist in most cases a true fibrous deposit, causing narrowing or actual obstruction? Repeatedly we could succeed in getting good inflation sound when the bougie encountered an obstruction, and, as has just been stated, an obstruction present one day and impassable, was strangely manageable the next day.

Much emphasis is to be put on the necessity of following up our cases to get the true results. It will be recalled that several patients reported as cured or improved, returned at a later period without any improvement. It is a question whether some of the cases would not have shown improvement equally well without the electricity, using only the bougie.

Electrolysis, while a new procedure in the ear, has been used for years in the urethra. Dr. Robert Newman has been its most energetic supporter, asserting that it affords a certain and permanent cure to urethral stricture, if properly applied.

That his views are not held by all workers in that specialty is shown by the conclusion to an article on the subject by so distinguished a syphilographer as Dr. E. L. Keyes, who, after a careful study extending over several months, says:

"My study of the subject and the experience it has brought me, digested with all the impartiality I possess, lead me to state that the allegation that electricity, however employed, is able to remove organic urethral stricture

radically, lacks the requirement of demonstration. The confidence of its advocates that it will *radically cure organic fibrous stricture* is, in my opinion, due either to the combined *credulity* of the patient and the *imagination* of the surgeon, or to some special but *fortuitous* act of Providence, upon the co-operation of which, in the case of his own patients, the general practitioner cannot with any confidence rely."

We feel warranted in drawing the following conclusions:

1. The electro-bougie has a place in our aural therapy—though a less important one than was at first supposed.
2. It should be used after and not before other methods of treatment.
3. It will be most liable to fail if any associated internal ear disease is present.
4. Its results are not always permanent—the stricture may re-form—we may hope rather for a diminution than a disappearance of the tinnitus.

Two cases totally relieved out of 25.

Two cases partially relieved.

5. Its use is not without danger—and a proper knowledge of the anatomy of the parts and of the technique is essential.

6. It is a question whether the process is a true electrolytic one, or if in many instances the obstruction is a true fibrous stricture.

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VIII.

CONTRIBUTION TO THE STUDY OF ANTRECTOMY.*

CONSIDERED AS AN OPERATIVE MEANS AND A PRELIMINARY STEP
TO OPERATIONS NECESSITATED BY THE COMPLICATIONS
OF MASTOID SUPPURATIONS.

BY DR. OLIVIER LENOIR,

TRANSLATED BY HANAU W. LOEB, A. M., M. D., ST. LOUIS.

INTRODUCTION.

This essay, which received the Laborie Prize of the Société de Chirurgie of Paris, is the record of work done in the laboratory of Professor Farabeuf when I had the honor of being his assistant. I was inspired in much of my work by the oral instruction of this eminent anatomist, and three of the figures in this work were received from him.

I have been guided, directed and sustained in these investigations by Auguste Broca. As will be seen, they have warranted me in recommending an operative procedure which was employed and advocated by him for several years and which, in his hands, has proved its worth. Without his kind collaboration it would have been impossible to carry out the work.

I desire to call the reader's attention to the original plates which I have designed from my preparations and dissections.

These investigations alone permit me to establish and to fix, with full knowledge of cause, a positive and harmless method of examining the antrum; I will add, at all ages, which is important, since the technique of the operation in children is so poorly described in most books that I might say that it is completely wanting.

I have not overloaded the text with the bibliography of the subject; this will be found arranged in alphabetical order at the end.

**Revue de Chirurgie*, July, September and October, 1901.

I.—ANTRECTOMY DESERVES TO BE STUDIED NOT ONLY AS AN OPERATIVE PROCEDURE, BUT ALSO AS A PRELIMINARY STEP TO OPERATIONS NECESSITATED BY THE COMPLICATIONS OF MASTOID SUPPURATION.

A monograph on antrectomy, its indications and contra-indications, its clinical and operative results, will be sufficient of itself to fill these pages. As I have said, my study has not been undertaken to make a resumé of what has been written and said about this operation.

I shall consider my purpose fulfilled if I can demonstrate on the one hand that the operation is easy, not only for experts but for the practitioner who is but slightly familiar with instrumentation, and, on the other hand, that it can be considered as the procedure of choice in interventions required by suppuration of the mastoid process.

My arguments and conclusions, in default of other merit, will have that of being supported by dissections and operations. Is not anatomy the foundation of operative medicine, and without it can there be proper clinical intervention?

That trepanation of the mastoid process may be in general made easy, that the opening of the antrum should never be dangerous—what a novelty to establish in these days of great surgical progress!

However, this operation, like all others, exacts preliminary knowledge which cannot be substituted by surgical dexterity.

Trepanation of the mastoid was formerly considered dangerous. I remember having seen the sinus opened on three occasions by surgeons properly considered as expert operators. And, errors excepted, a fair number of antrectomies are followed by facial paralysis. I speak only of facts fully acknowledged by practitioners. I believe then that no one will dream of reproaching me for seeking to establish, in a precise way, the operative rules for opening the antrum.

The best proof of the necessity for an operative manual arises from the decided divergence of technique which was announced by Ricard in 1889. According to experience a multiplicity of procedures to accomplish the same

result shows that the knowledge of the subject is not complete.

The number of works is being multiplied, especially in France, where the interesting monographs of Duplay, Ricard and A. Broca have firmly grounded the anatomy and surgery of the mastoid process.

But the title calls for something more and better than antrectomy, viz., that this operation constitutes the preliminary step in most of the interventions directed against the complications of otitis media, and that it is in the absence of complications the best means of avoiding them.

In every case where pus spreads toward the mastoid cells toward the meninges, the brain or the sinus, does it not begin by invading the antrum? It is then not unreasonable to go, from the very first, to the point where the infectious agent starts in its ravages. Manifestly it is well in surgery to trace the origin of pus, but when this is done, is it not best to go to the source direct?

I maintain that all of the complications of otitis media may be relieved by antrectomy, especially simple suppuration of the cells. I do not admit an unlimited belief in the opinion of Politzer that, in mastoiditis consecutive to gripal otitis, resection of the mastoid surface is sufficient in most cases. It seems to me that such resections may be classed with Wilde's incision, which has lived its day and which is only applicable in mastoid periostitis. It is true that among surgeons who are content with stripping off the mastoid, some may be found like Hoffman of Königsberg, who declares that his patients are improved, when no pus is found, and who claims that the operation acts in these cases as iridectomy in glaucoma by causing diminution of the brain pressure. I must condemn superficial curettage, the results of which are hardly better than the temporary expedient proposed by Loewenberg and Pauzat who considered trepanation as the exception, while I look upon it as the rule in these cases.

I believe that Hessler of Halle is in error when he makes an excision of the cells without opening the antrum. If it is desired to treat the mastoid cells why not look after the source of pus, the one cell which is always present, the antrum? Why not perform antrectomy? It is the antrum

which should be investigated, since it is the only cell which exists in all ages.

Duplay, who taught us to differentiate periostitis from mastoiditis proper, advises that the antrum should always be opened when suppuration of the cells is present.

A. Broca insists upon the necessity for trepanation even if the bone seems healthy under the periosteum loosened by the pus. I shall not consider, except for purposes of reminder, the evident facilities furnished by antrectomy for cleansing the attic and for various special operations upon the ossicles ankylosed or bathed in pus—I address myself not to specialists but to surgeons. I am desirous of bringing to light the utility and necessity for antrectomy in the treatment of the intracranial complications of otitis media.

Through the agency of asepsis, surgical intervention is justifiable in a fair number of meningeal and cerebral complications of otitis. Sinus phlebitis is also a matter for intelligent and courageous intervention.

It is all the more logical to consider antrectomy as the first step in these operations, as, if there is a cerebral complication, it most frequently attacks the side upon which the otitis is, without there being necessarily denuded bone corresponding to the cerebral suppuration.

Nothing is easier than to make a passageway to the cranial cavity by way of the antrum. This will be readily perceived after studying the anatomy of the mastoid and of the antrum, and the means of entering this cavity.

II.—PERSONAL INVESTIGATIONS UPON THE ANATOMY OF THE MASTOID PROCESS; STUDY OF THE OPERATIVE LANDMARKS AND DANGERS.

No pretense is suggested of presenting the complete anatomy of the mastoid process and adnexa of the middle ear; I pass over rapidly the points which have not been made the object of personal study.

Perhaps the development of this part of the work which is intended to be surgical will be found most important. But when it concerns operative medicine, one cannot do too much to elucidate the knowledge of the grounds upon which intervention is based. Too much importance cannot be

placed upon the study of the different landmarks by virtue of which the surgeons make an exact section. In this experimental study I intend to show the nature of the mastoid, the disposition of its cells and the different landmarks which permit trepanation with complete security.

Another part, in my opinion more important yet, is devoted to the situation of the organs which it is indispensable to map out in antrectomy, either simple or complicated by more serious operative indications. It is necessary to know not only where to attack but also where to pass—and what to avoid.

Finally, I must remark that my investigations have been made in adults, adolescents and children. For want of sufficient data, an operator is liable to fall into the grievous habit of extending to children and adolescents the operative practice which should be reserved for older subjects.

ANATOMIC GENERALIZATIONS. The mastoid process is situated on the external surface of the temporal, behind the auditory canal. It has a slightly oblique direction from above downward, and from behind forward. It is most frequently conoidal. Its anterior border, thick and rounded, is distinctly vertical; its posterior border is in adults inclined about 45° downward and forward.

The apex is generally teat-like, and affords attachment to the muscles, which do not concern us. I may mention the mastoid foramen, situated behind its upper portion. This foramen, whose existence and dimensions are variable, gives passage to a vein which generally joins the lateral sinus. It is evident that the size of the mastoid process depends, for one thing, upon the power of the muscles attached to it. I may state that it generally agrees with the osseous dimensions of the individual.

I have had occasion to see in the Anthropologic Museum, in Manouvrier's collection, the skeleton of a giant in which the mastoid process, truly monstrous in size, was in striking contrast to that of a dwarf in a neighboring case.

The Size of the Mastoid Process. But the size of the mastoid process is nearly always in direct relation to the age. The plates here presented are in this respect a perfect demonstration. In the fetus at term (see figures 9, 10, 11, 12, 13, 14) there is, as it were, no mastoid process. In children three years of age (see figures 15 and

16), and in those of five years of age (see figure 17) it is already perfectly outlined; at the age of 13 years (see figure 18) it shows in miniature the form of the adult's (compare figures 1, 2, 22, 23, 25, 26, 27, etc.).

This difference in size of the mastoid occurring in different ages may surprise us, since certain parts of the temporal, the ossicles for example, are almost (a curious fact) fully developed in the fetus at term. We find the explanation in studying the development and constitution of this part of the temporal.

DEVELOPMENT OF THE MASTOID PROCESS. Two portions of this bone unite to form the external surface of the mastoid process, the squamous portion anteriorly and superiorly, and the petrous portion inferiorly and posteriorly. We note, and this is important, that the tympanic ring takes no part in this formation. The union of these two pieces, schematically shown in Poirier's treatise on anatomy, results in a suture, the mastoido-squamous suture (s m s in figures) which runs upon the external surface of the process, starting from the parietal incisure and ending anteriorly and superiorly upon the tip, without it being possible, it seems to me, for one to feel the terminal notch as Chipault represents.

LANDMARKS.

THE MASTOIDO-SQUAMOUS SUTURE. According to the forgoing, it will be seen that the volume of the mastoid process is in direct proportion to the osseous portion behind and below. However, in the fetus and in young children, the exocranial face of the petrous portion does not exist, as it were. We should therefore not be surprised that the mastoid process is not observed in subjects of this age.

I insist upon this fact, that I have always found in the dry crania of all ages examined, traces of the mastoido-squamous suture under the form of a furrow, more or less irregular and uneven. It is still easier to observe it in the living or upon the cadaver by scraping the external surface of the process. In this position considerable effort must be made to detach the periosteum, which penetrates it in the form of an easily recognizable, whitish fascia.

A portion of the squamous forms therefore a part of the process. This squamous portion is limited by a transverse ridge which, as we shall see later, is important from our special point of view. This is the supramastoid ridge (*c m s* in the figures), the prolongation of the zygomatic process, describing a curve with an antero-superior concavity (is this the horizontal ridge which Chipault describes?) This ridge, projecting more or less according to the subjects, seems nearly constant in children, as can be seen in a table which will be presented later.

SUPRAMASTOID RIDGE. The supramastoid ridge corresponds to the floor of the middle fossa; it is situated sometimes at exactly the same level, but almost always a



Fig. 1. Typical position of Henle's Spine. It is seen that it is not continuous with the tympanic ring. *csm.* supra-mastoid ridge.

little above (Chipault). We will see that these variations in the mastoid surface establish the landmarks for antrectomy. Its importance is so great that I think it deserves a special study.

HENLE'S SPINE. Upon the external surface of the temporal, below the origin of the supramastoid ridge, above the posterior-superior fourth of the osseous auditory canal is found a rough projecting spine in the form of a curved lamella, almost concentric to the circumference of the osseous canal. This is the spine of Henle, "spina supra meatum" of the Germans, "épine tympanale" of Poirier (*H* in our figures). This eminence in the form of a lamella describes a curve with an antero-inferior concavity, its

anterior extremity being always nearer the circumference of the osseous canal than the posterior.

Henle's spine is not situated exactly upon a plane tangent to the surface of the mastoid but somewhat deeper. In order to uncover it in operating on the mastoid, it is necessary to push the instrument as if one wished to penetrate into the postero-superior segment of the osseous canal. It is bounded posteriorly by a vascular zone which varies in different subjects, these differences resulting perhaps from ethnologic conditions. Sometimes this is a simple cleft like a scratch, the borders of which present only microscopic foramina, which I have observed in a

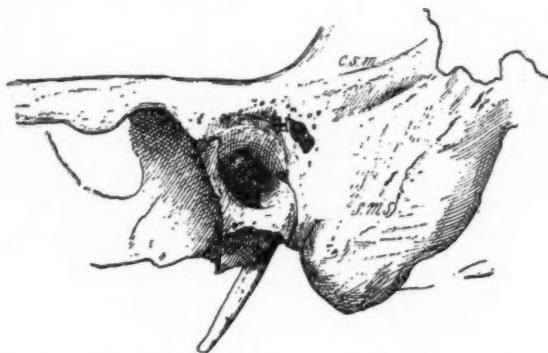
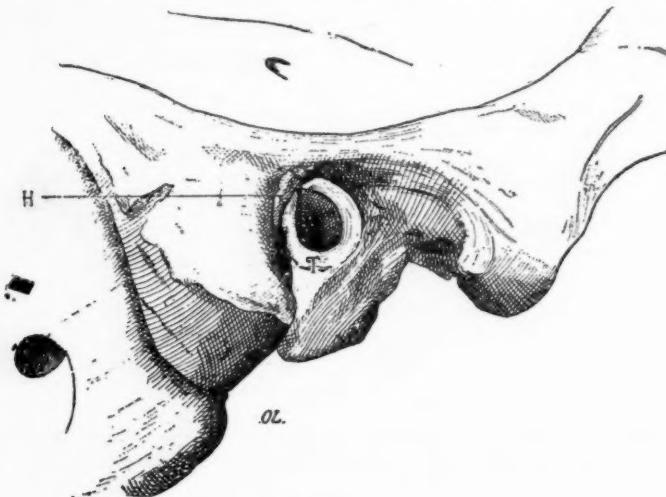


Fig. 2. A case in which there is behind Henle's spine a large foramen which leads to the petrosquamosal sinus. *sms*, mastoido-squamous suture.

series of Peruvian skulls in the museum. And sometimes behind the lamella is found a cup-like depression, of slight depth, absolutely riddled with holes. This is the most common condition (see fig. 1). Finally, at times in the dried specimen, the zone which is found behind the suprameatal spine is replaced by a large opening (fig. 2). We shall have occasion to recur to the morphologic value of these vascular orifices.

Morphologic Value of Henle's Spine. What is the significance of this spine which we can not study too much, since it is the most important landmark in antrectomy? Poirier (*Anat. topog.*, p. 224) expresses it thus: "Having studied the tympanic bone upon a hundred skulls I have

often observed the lamella in continuity with the tympanic bone. Like the latter it is a secondary formation and is not found on the temporal bone of the newborn; besides it gives insertion, as the tympanic bone, to the fibrous portion of the canal. I propose to give it the name 'épine tympanale.'" In this particular I do not share the opinion of Poirier. I have examined with this special point in view almost 200 skulls at the Anthropologic Museum, and at the museum I have examined the skulls by the score daily for several months, but never in well preserved skulls



Adult Horse.

Fig. 3. The tympanic ring is almost completely closed; Henle's spine instead of occupying the place it does in man is a well developed osseous point not continuous with the tympanic ring.

have I been able to find one in which there was continuity between the tympanic bone and the spine of Henle. Always as in figure 1, in which I have sought to reproduce the type, I have seen the posterior border of the annulus tympanicus penetrating obliquely above and within the auditory canal, separated from the suprameatal spine by an appreciable distance, often by a considerable space (fig. 2). Besides there is proof drawn from comparative anatomy which seems to be conclusive. In the adult

horse, (fig. 3), the tympanic ring is almost completely closed; the two extremities of the ring are not separated by the distance of one millimeter.

However, in this animal, precisely at the spot where the spine of Henle is found in man, we see an osseous point separated perceptibly by a deep groove from the tympanic ring with which it is not joined; it is a distinct bone. We are justified in comparing this osseous point with the Henle's spine in man.

In the gorilla, the spine of Henle, which is generally plainly visible, separated from the annulus tympanicus, lies just above the circumference of the osseous canal.

In my opinion, the spine does not arise from the tympanic ring; I believe rather that it is formed at the expense of the osseous point known in embryology under the name of epitympanum (Geoffrey Saint Hilaire), the projection formed by this eminence being a factor of the importance of the vascular perforation previously mentioned, whose morphologic and operative value we shall establish later.

Pardon this digression: Henle's spine seems too little understood—it is an important landmark.

Is Henle's Spine Constant? Is it constant and can we count upon it as a landmark? When Grandhomme said that it was but slightly marked and useless, Riesselbach stated that he had found it 82 times out of a hundred and Schultz had failed to find it only 11 times in 120 temporal bones.

For my part, in 100 adult skulls in perfect state of preservation which I have summarized, I have failed to find it only a single time and this was only unilateral. 20 times (note that this includes 200 spines) it was only slightly marked, but recognizable by the eye and skilled finger. Are we not right in depending upon its existence for operative purposes?

Does Henle's Spine Exist in Children? So far we have only spoken of adults—does it exist in children?

Before deciding this, I ask my readers to examine the following table made after studying 15 skulls (30 spines) of children of different ages, which may be seen in the Museum of Anthropology. The importance of each spine is determined by the following numbers.

- 0 indicates no spine.
- 1 barely perceptible.
- 2 slightly marked.
- 3 marked.
- 4 well marked.
- 5 strongly marked.

Similar numbers are used to indicate the importance of the two landmarks, the supramastoid ridge and the masto-ido-squamous suture. Their value in each child can thus be determined. Finally I have profited from these measurements, so that I can establish in these subjects the non-continuity of the suprameatal spine with the tympanic ring and the vertical distance separating the spine from the highest point of the posterior division of the annulus tympanicus.

If we assume that 2 (which corresponds to a slightly marked spine) is necessary for the purposes of a landmark, it is evident that we can hardly count upon obtaining it before the fourth year. We can not then depend upon the spine in very young children, and it can only be considered as certain in those above ten years of age.

A SPECIAL LANDMARK IN YOUNG CHILDREN. The study of the mastoid surface, induces the study of an anatomic peculiarity which, as will be seen, may give us valuable indications as to the manner of performing antrectomy in young children.

I do not believe that the special landmark which I am reporting has been studied, so permit me to expand somewhat upon this subject. I have said before that behind the spine of Henle there are certain vascular foramina more or less considerable, visible in all the crania which I have examined. In adults the orifices not only exist in the position which we have indicated but also are often prolonged above the superior wall of the osseous canal, immediately below the supramastoid ridge at the origin of the zygoma.

This may be observed by examining figures 1 and 2 which show, the first especially, the most common types.

In children, there is little or no spine of Henle. So the zone of vascular foramina is in the main reduced to the second of the two types which we have described. At least this zone is easily visible; to the eye it appears, in the pre-

No. of series.	Age.	Side.	Spine.		Supramastoid ridge.	Mastoido-squamous suture.	Vertical distance separating spine from highest point of posterior divergence of annulus.
			Volume.	Continuity with tymp.			
1	2 months	R.	1	0	1	2	
		L.	1	0	1	2	
2	1 year	R.	1	0	1	2	
		L.	1	0	1	2	
3	1 yr. 8 mos. 5 d.	R.	1	0	1	2	6
		L.	1	0	8	2	6
4	2 yrs. 8 days	R.	1	0	1	0	7
		L.	1	0	1	1	7
5	2 yrs. 1 month	R.	0	0	2	3	
		L.	0	0	2	3	
6	3 years	R.	2	0	2	2	7.5
		L.	2	0	1	1	6
7	3 years, 8 days	R.	1	0	0	0	4
		L.	1	0	0	1	5
8	4 years	R.	1	0	1	2	6
		L.	2	0	1	2	5
9	4 years	R.	3	0	1	2	7
		L.	3	0	1	2	7
10	5 years	R.	2	2	1	1	2
		L.	3	0	1	3	7
11	6 years	R.	2	0	2	2	7
		L.	2	0	1	3	7
12	8½ years	R.	1	0	2	2	6
		L.	1	0	2	1	7
13	10 years	R.	2	0	2	3	6
		L.	2	0	2	3	7
14	14 years	R.	3	0	2	1	5
		L.	3	0	2	1	5
15	15 years	R.	3	0	1	1	5
		L.	3	0	1	1	5

pared skull, as a veritable sieve with very small holes and, in the fresh cadaver of a child, as a spot resembling a sanguineous suffusion in the bone. At this point the bony tissue engorged with blood is particularly soft and friable. By a valuable coincidence—we can only call it a coincidence—in fetuses of more than eight months and in children from one to two years old, which I have examined, I have always found the antrum to correspond exactly to the before mentioned spongy spot (*tache spongieuse*, Fig. 4 and 5). Why? I do not know, and I am not ashamed to say it, but in every case it so happened. The bone in this position is so friable and the landmark is so positive that there is nothing easier than to uncover the antrum in



Subject No. 3. Fetus $7\frac{1}{2}$ months, right and left sides.
Figs. 4 and 5. In this subject, the position of the antrum corresponds on both sides exactly to the spongy spot, permitting penetration of the cavity at the first stroke. Note the position of the antrum above the auditory meatus.—*c.m.s.*, supra-mastoid ridge; *T*, tympanic ring; *Sp*, spongy spot.

a subject of the age indicated by scraping the bone with an old notched bistoury.

I have repeated this observation many times with A. Broca, and his clinical experience has led him to attack the temporal in exactly the same place in making antrectomy in young children.

Later on the vascular zone corresponds to the posterior part of Henle's spine. Curious point in this connection, for it is Henle's spine which becomes the landmark. It seems that these points which serve as a guide, describe in proportion to the age, a curve from before backward and from above downward, the center of which is situated almost at the apex of the osseous canal.

We shall later see my studies have led me to describe an

identical change in the position of the antrum depending upon the age.

Morphologic Value of the Spongy Spot. What is the significance of these openings? In what follows I am submitting to the reader simply a hypothesis, with the attempt to support it by facts.

In children these orifices are very numerous; in the fetus as Farabeuf and Launay have well demonstrated (Thesis, Paris, 1896) and likewise in the lower mammals "the intra-cranial blood not being able to flow through the internal jugular vein, absent or altogether insufficient, leaves the cranium through the openings in the temporal bone so as to join the parotid plexus."

These paraglenoid (post-glenoid and supra-glenoid) foramina are situated exactly in the region occupied by the vascular area. They provide communication for the blood from the lateral sinus with that of the external jugular through the medium of the petro-squamosal sinus. In the two young subjects which presented the most manifest *tache spongieuse* the petro-squamosal sinus persisted. On the other hand, in one instance (fig. 2), the foramina in the neighborhood of the spine were so large that they formed quite a cavity behind this lamella. A probe which was introduced entered, to my great astonishment, a well-developed, persistent, petro-squamosal sinus.

Since the existence of this vascular zone seemed connected in part at least with the passage of the intracranial blood toward the parotid plexus of the external jugular, I thought it wise to examine the conditions existing in animals with a well developed petro-squamosal sinus.

Fig. 6 represents the temporal bone of a goat. The perfectly developed petro-squamosal sinus, followed into the interior of the skull, issues, as is easy to be seen, behind the tubercle on the transverse root of the zygoma, between this organ and the anterior branch of the tympanic ring. Immediately above the wall of the canal shows a series of plainly visible foramina, penetrating the external wall of the venous canal. Are we not correct in supposing that the vascular foramina in the vicinity of Henle's spine are in connection with the passageway of the venous blood from the lateral sinus toward the external jugular?

OBSTACLES.

Before entering upon the study of the structure of the mastoid, I think that we ought to say a word about the first obstacle which the surgeon encounters in operating, the compact external table of the mastoid.

THE EXTERNAL TABLE OF THE PROCESS. In young children the bone is too thin to require particular attention, but in adults it is not unimportant to know the thickness of the compact tissue which we must penetrate before entering the cells. One of the few writers concerning themselves with this factor, Chipault, considers the thickness of the



Goat.

Fig. 6. In the goat, the petrosquamosal sinus prolonged opens between the anterior branch of the tympanic ring and the transverse root of the zygoma. The wall of the canal is perforated by orifices exactly in the zone corresponding to the vascular foramina which I have studied in man.

external table as varying from one-third to three millimeters. In my opinion the variation is much more considerable. If reference is made to my sections (figures 19, 20, 24) it will be seen that in the first two the thickness of the compact tissue is hardly one millimeter in certain places, while in figure 24 it measures not less than 6 millimeters, which it is necessary to pass through before reaching the cells.

Such a thickness seems common enough and it will be well to remember not to mistake (as sometimes happens) a process hard to incise for a sclerosed process without cells.

THE MASTOID CELLS. We come now to the internal make-up of the mastoid process. It is important from the very first, as Poirier says, in order not to fall into error in the description of these cavities and the different types which they assume, to recognize and to separate sharply two orders or systems of very different cavities; the one, constant, almost invariable in its form, its dimensions, its situation has, as its center and principal part, the mastoid antrum; the other, very variable in its development and of multiplied types, includes the mastoid, squamous and petrous cells.

We will study the cells first and the antrum later. This order is neither logical nor anatomic; it is adopted only because it corresponds to the order of operation. Nevertheless the development of the cells is considered at the same time as that of the antrum since both are intimately connected.

The Mastoid Cells proper are of little importance compared to the group to which this name is given in surgical parlance. If we cut away the squamous and petrous cells, to which we shall return, the mastoid cells alone will remain, occupying the part of the process lying below a horizontal line which passes close to the junction of the superior third with the inferior two-thirds of the auditory canal.

The openings vary greatly in volume. Duplay, who first made known in France the differences in the nature of the mastoid process, thus expresses it: "From the researches of Hartmann, Bezold, Politzer and Zuckerkandl it appears that sometimes the pneumatic cells predominate over the spongy tissue of the bone. Sometimes the spongy tissue tends to exceed the pneumatic cells, and sometimes when these latter have almost completely disappeared, the mastoid process is almost exclusively composed of ordinary diploic tissue or, in certain cases, of a sclerosed compact tissue hard as ivory. These three varieties, in structure, of the mastoid process, have been designated by different writers as pneumatic, diploic and sclerotic mastoid."

Zuckerkandl, cited by the same author, estimates that in 100 mastoids, 36.8 are pneumatic, 43.2 half pneumatic, half diploic and 20 entirely diploic or sclerotic.

In a general way, I may state that if the temporal is con-

sidered pneumatic, the most beautiful cells will be found in the mastoid proper. It is difficult to find more perfect cells than the enormous ones shown in figures 25, 26 and 27.

Ricard, in his excellent work on the anatomy of the mastoid, makes the very proper observation that "a mastoid which is pneumatic in front may be sclerotic or diploic behind." We must expect the greatest differences in different individuals and, all the more in certain diseases, the primary structure of the process may be modified in the most unexpected manner.

Nuvoli and other writers have described in certain cases of otitis media a special sclerosis of the process.

In a case cited by Huntington Richards the process was as hard as ivory. He drilled almost four centimeters without finding the antrum. The operation continued with chisels gave no better result; the antrum could not be found; the sclerosis had completely involved the region. Although we may be somewhat skeptical as to the non-existence of the antrum, we must admit the deep sclerotic modification of the osseous structure as possible.

Can We Predetermine the Structure of the Mastoid? Is it possible to foresee the internal character of the mastoid? I do not believe so. Auscultation of the mastoid process, praised by Hugh Jones, its illumination commended in France and other countries, seem to be untrustworthy. On the other hand I do not believe that we can decide the question of the volume of the cells from that of the mastoid, as has been claimed. Small processes, such as those shown in figure 25 and 26, may contain enormous cells. And then even if we recognize the nature of the mastoid cells proper, could we draw from it any therapeutic and operative indication concerning the squamous and petrous cells, otherwise important pathologically and anatomically, and of which the cells of the first category may be considered as adnexa?

If any cells are wanting they will be those of the mastoid group. There is nothing lost, then, in not being able to judge them in advance. Let us now pass to the description of the squamous and petrous cells.

The Squamous Cells are situated in that part of the squamous which goes to form the superior portion of the external auditory canal; Ricard has well said that they

could be found in front of the canal, at the root of the zygoma, above the temporo-maxillary articulation. Squamous cells of small dimensions may be seen in figures 25, 26, 27. Those in fig. 22 are large, well formed and rounded. In the main they seem small, yet one must remember them and exercise care in treatment, as shown in our figures, if it is desired that the operation be complete.

The Petrous Cells occupy the base of the process. They are limited below by a horizontal line passing through the junction of the lower two-third and the upper one-third of the osseous canal. Above they may go as far as seen (cc) in figures 22 and 23. Anteriorly they may be limited by the arched premastoid lamina (P fig. 24) which is described below. Posteriorly they are directed toward the lateral sinus, toward which they are shown extending in figures 26 and 27, and especially in figure 22 in which the lateral sinus L and the dura mater have been drawn.

If the reader refers to the horizontal sections shown in figures 19, 20, and 24, he will see how these cells are truly petrous in character as well as name.

The three sections show the relation of the petrous cells to the lateral sinus L from which they are separated by a thick bed of compact tissue as in figure 24, or by a thin lamella as in the other two sections. It can be seen from these two sections how easy it is for inflammation to extend into the sinus.

Figure 24 shows that the petrous cells (C) may be behind the antrum, along the posterior surface of the petrous which, however, pathologically and by reason of continuity, should be connected with the mastoid cells.

Concerning What is Called the "Aditus Externus." It often happens when the external table is raised, that the operator sees, a little above Henle's spine, a special cell which seems deeper than the surrounding cells. If a probe be introduced into this cavity, we may be surprised by not feeling it arrested by the cell and its entering without difficulty into the cavity of the antrum. I have observed a similar canal, evident and conspicuous about once in three times, and I propose for it the name "aditus externus." The opening is faithfully presented in figure 25 (Ad.) Happy is the surgeon who finds this; his task will be greatly simplified. I repeat, it does not always exist.

In my opinion it is only the persistence of one of the developing cells which pass from the antrum to penetrate the mastoid.

THE PETROUS ANTRUM. Finally we come to the antrum, the object of this study.

Development of the Antrum. Let us first study its development, so closely related to the mastoid cells.

If the mastoid does not exist in the fetus, and, as it were, in the new born, we find even in them a cavity called the mastoid antrum, which is prolonged behind the attic into the depth of the petrous, and which may be properly called the petrous antrum, as Poirier remarks, for it is hollowed out of the petrous.

The antrum in the fetus at full term and in the new born, is almost as large as it becomes later in adults. The air cells which ought to spread into the squamous, petrous and mastoid seem to proceed from it; they radiate from it, budding around with a mechanism quite comparable to the development of the sinuses of the face. At birth, in opposition to what has been said, some air cells are almost always present. They can easily be seen by the following procedure which I have seen Professor Farabeuf employ. A small quantity of mercury is placed into the tympanic cavity of a newly born infant's cranium and then it is turned over and shaken slightly; the metal passes from the cavity into the aditus, and from the aditus into the antrum. If the external surface of the temporal behind the tympanic ring is scraped away, the vacuoles filled will mercury will often be seen.

A fact to be noted is that the mastoido-squamous suture presents, for a time, a barrier to the growth of the cells which have not passed it in the course of the first year.

Traces of the suture are generally found later in the interior of the process in the form of a small wall bordering one or more cells, and corresponding exactly to the groove on the surface. In the case pictured in figure 26, this feature was much accentuated.

Depth of the Antrum. At what depth does the antrum lie? The question is important from the operative point of view and deserves profound study. It has not been studied in children, at least I have been unable to find an article on the subject.

In the fetus at term and in children less than one year of age which I have examined, the depth of the antrum was inconsiderable and varied from 2 to 4 millimeters to the point at which, I repeat, nothing is easier than to open it with a dull bistoury.

As the child increases in age, the antrum recedes (this inexact expression will be pardoned) irregularly, varying greatly in different individuals. In figure 15, from a child aged 3 years it had already attained a depth of 10 millimeters, while in figure 17 (child of 5 years) the depth was only 4.5 mm. In figure 18 (subject 13 $\frac{1}{2}$ years of age), the cavity was 11 mm. from the surface. This is already the depth found in adults. We may conclude by saying that in children the depth of the antrum seems to be in general almost in direct proportion to the age, however, it does not necessarily correspond to any exact figure for the respective years.

In adults differences are also found. We shall seek to determine their extreme limits in order to know where we should go, and how far we may go, without injuring important organs.

Writers differ singularly on this point. We read in Politzer that if after having attained a depth of 5 to 6 mm. in the direction of the antrum compact tissue is still found, we should stop. In my opinion such an otologist must often fail to reach the antrum. Noltenius seems equally timorous in concluding, after examining 22 normal petrous bones in Hartmann's collection, that trepanation of the mastoid cannot reach 20 mm. without danger of wounding an important organ, the facial or semicircular canal. I recall that Lichtenberg of Buda-Pest operated upon a man 44 years of age in whom he found no pus until he reached a depth of more than 2 centimeters. Schwartz says, "It is not necessary to go more than 2.5 cm. Chipault fixes as extreme limits 1 cm. and 2.5 cm."

As to my personal investigation, I wish to say that two subjects, No. 10 and No. 11 (figures 19 and 20), aged 45 and 25 years, had the petrous antrum situated at a depth of 16 and 15 mm. respectively, while in No. 4 and No. 5 (figure 22 and 25) the following are the figures for the two sides: No. 4, 2.5 cm. and No. 5, 2.7 cm. I am then right in saying that it may be necessary to excavate to a

depth of almost 3 cm. in order to reach the antrum in adults. Of course, these exceptional cases must be handled with extreme care.

Position of the Antrum with Regard to Landmarks. I have described a certain number of varying conditions on the surface of the mastoid: the *tache spongieuse* in children; the supramastoid ridge; the mastoido-squamous suture, and Henle's spine in all subjects in general. I shall not reconsider the facilities already pointed out which give to us in very young children a friable point and a well marked coloration upon the bone; and in what follows I shall strive only to establish the topography of the antrum in regard to the landmarks studied on the mastoid surface, determining whether or not it is invariable in all ages.

First, I will say that, in the subjects of all ages which I have observed, whether fetus or adult, the antrum is constantly found below the supramastoid ridge, above and anterior to the mastoido-squamous suture which, I repeat, offers usually a decided resistance to the instrument when we seek to elevate the periosteum from the mastoid. These two points are not constant landmarks in children. They are, however, not to be disdained if they are recognizable and in adults they contribute always to the limiting of the field of operation which the following limits definitely. I have previously announced the full importance which is presented from an operative point of view by Henle's spine, an eminence which is constant and easy to discover. Now I wish to determine the exact position of the antrum with respect to this lamella.

Inasmuch as it appears relatively late, I have taken in children, as an external landmark in this region, the apex of the ellipse formed by the bony auditory canal. It is important to consider at the same time the variations of position of the antrum in adults and in infants. Here are the results of my investigations.

In order to group these into a table striking to the eye, I have used the following notations: I designate as height (in millimeters) the vertical distance from the center of the antrum to a horizontal line passing through the apex of the curve of the osseous canal, in subjects having no spine of Henle, and through this spine in older subjects. As radius, I designate the distance between the center of

the antrum and spine, or apex of canal in young subjects.

Number of Subject	Age.	Height.			Radius.		
		Right	Left	Average	Right	Left	Average
3	Fetus 7½ months	5	6	5.5	5	6	5.5
2	Fetus 8½ months	3.5	3.5	3.5	6	7	6.5
1	At term	7	4	5.5	7	8	7.5
8	3 years	2		2	10		10
6	5 years	1		1	5		5
7	13½ years	0		0	6		6
11	25 years	0	0	0	7	7	7
4	60 years	0	0	0	7	7.1	7.05
5	75 years	0	0	0		7	7

These results may be investigated in an instructive manner from the following drawing which represents the temporal bone, inasmuch as it shows the various positions of the antrum at different ages. The distance which separates the spine from the apex of the osseous canal has been determined by a succession of calculations giving a sufficient approximation, but too intricate for me to fatigue the reader with it.

If inexact language may be permitted (for it is not the antrum which changes its position), speaking figuratively we may make the following resumé:

The antrum, situated at first, in the fetus at term, above and a little behind the roof of the osseous canal, changes its position in proportion to and in measure with the age from above downward and from before backward, descending and receding more and more from the apex of the canal. The curve described by these successive positions reaches a horizontal line, drawn through Henle's

spine, about the tenth year. From this time on, the center of the antrum does not further descend but recedes horizontally backward until it attains a maximum distance of 7 millimeters in adolescence.

I do not pretend to establish a formula good for all cases—exceptions always occur—but it seems to correspond to the usual condition of things.

THE ADITUS. A large number of smaller cells than we have already studied open through the walls of the antrum, which represents the largest of the petrous cells.

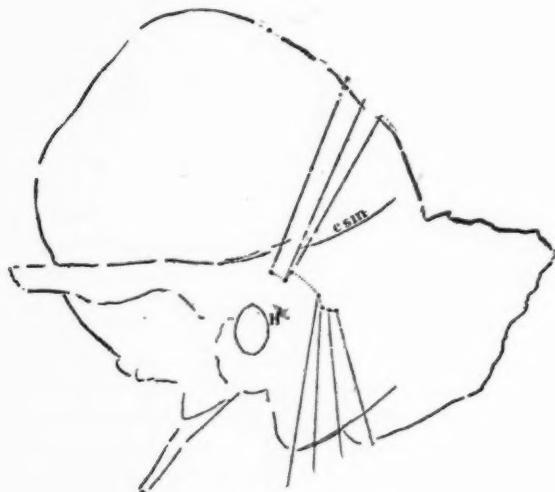
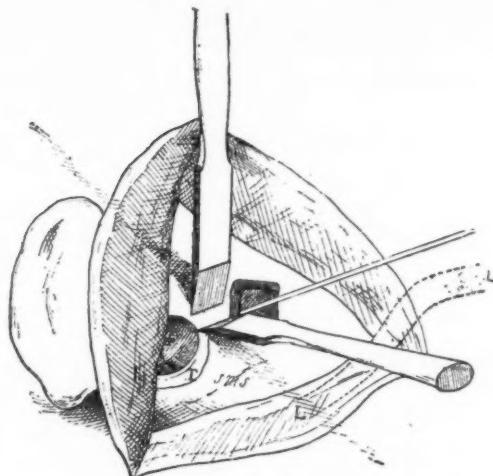


Fig. 6a. Henle's spine.

Upon the anterior wall we see the orifice of the aditus, the canal which is the communication with the supratympanic cavity, the attic. A probe introduced from the antrum into the aditus is directed obliquely from behind forward, from above downward, and from without inward (see figs. 7, 9, 10, 11, 12, 14). Note that after passing the cavity of the tympanum, the probe is engaged in the Eustachian tube, the tympanic orifice of which is found opposite to that of the aditus. This fact is well shown in figure 4.

In adults the aditus is 3 to 5 mm. long, about 3 mm. in height, and 3 to 4 mm. in depth. Its roof and internal wall

Subject No. 2. Fetus 8½ Mos.



Left side.

Fig. 7. The antrum is opened; a probe is placed in the aditus which the chisels are about to enter. Notice their inclination which avoids the middle fossa and the bend of the facial.—T, tympanic ring; cms, mastoido squamous suture; L, lateral sinus.



Right side.

Fig. 8. Simple opening of petrous antrum.

Subject No. 1. Male child at term.

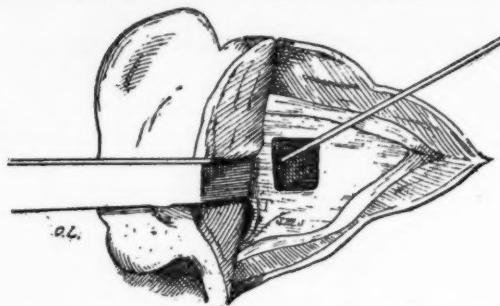


Fig. 9. Auricle drawn forward, antrum opened, probe in aditus—note the position of the antrum.

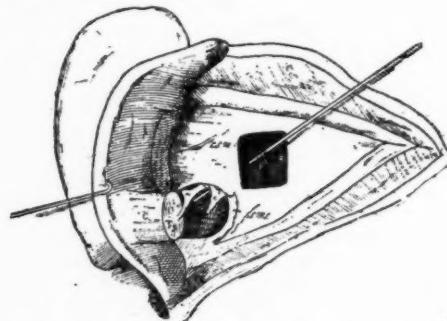
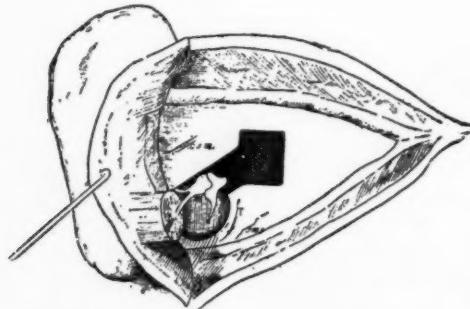


Fig. 10. Auditory canal (soft parts) drawn forward with the auricle, drawing by accident the tympanic membrane which still adheres to the hammer. The end of the probe is seen between the hammer and the anvil.



Left side.

Fig. 11. Aditus opened; short process of anvil lying there.

are formed by the cells; its floor is traversed by the horizontal portion of the aqueduct of Fallopius. On the internal wall is seen the projection of the horizontal semi-circular canal. We may note that pathologically it may be obstructed by bony formations, consequently cauterization may be impossible.

THE TEGMEN TYMPANI. The roof, the top of the antrum, is formed by the tegmen tympani, a lamella often dehis-

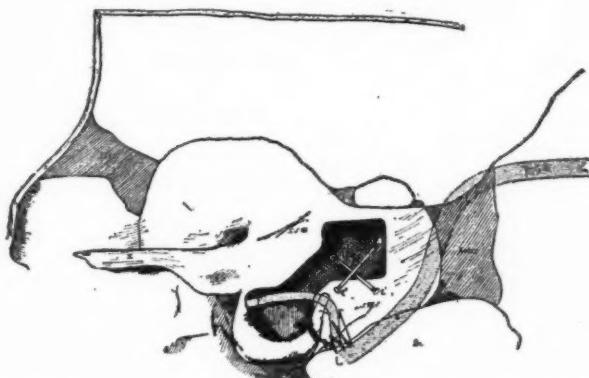


Fig. 12. It seems that there is no danger of injury to the facial or sinus. Two pins, e' stuck into the middle fossa, e'' into the inferior fossa of the base of the cranium. Position of the sinus in relation to the asterion.

General key for the figures.

sms, mastoido squamous suture; cms, supra-mastoid ridge; T, tympanic ring; Ty, tympanic membrane; c, auditory canal; m, hammer; e, anvil; p, promontory; L, lateral sinus; F, facial; Z, zygoma; Pter, pterion; Aster, asterion; Pa, parietal; Oc, occipital.

cent, generally very thin, always perforated by branches of the meningeal vessels, and presenting the remains of the internal petrosquamous suture. We shall see later the operative deduction which may be drawn from these facts.

THE OPERATIVE DANGERS.

The position of the antrum being indicated, the passage which leads from it being determined, we should study the operative dangers encountered in opening it. These or-

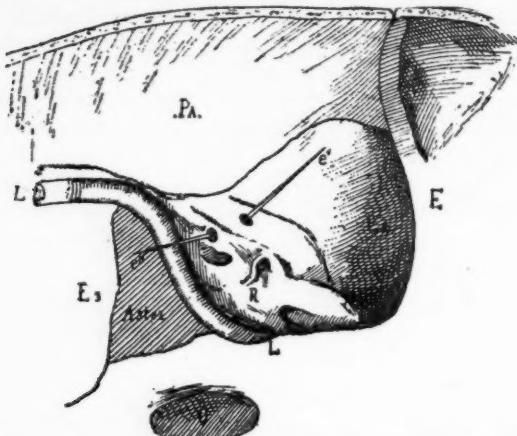
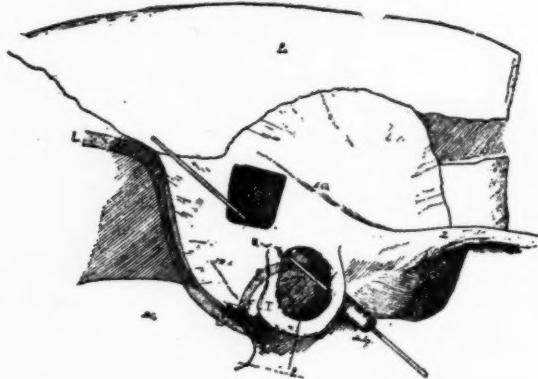


Fig. 13. Interior of the skull showing the ends of the two pins $e' e''$ of Fig. 12, thrust through the antrum. Position of the sinus in relation to the asterion.



Right side.

Fig. 14. Note the position of the antrum, the facial canal and sinus. Probe is seen thrust into the aditus and engaged into the tube. Position of the sinus in relation to asterion.

gans are to be avoided — the semi-circular canal, the facial and the lateral sinus.

What then, is their exact position?

THE SEMICIRCULAR CANAL. The semicircular canal will not detain us. Wounding it is not of parallel conse-

quence to that of wounding the sinus or facial nerve. We know that it is behind the internal wall of the aditus. In order to get close to it it is necessary to have uncovered the antrum; and at that moment a good protector applied upon the internal wall of the aditus will permit us to act in full security. Besides, the canal is surrounded by a solid ivory shell, the resistance of which does not in any manner resemble the friability of the mastoid cells.

THE FACIAL NERVE. This nerve, starting from the hiatus Fallopii, is directed externally parallel to the axis of the petrous for about ten millimeters. Then it is deflected, taking a vertical direction downward, leaving the skull by the stylomastoid foramen. Of these two portions, the first is already known to us, as that portion which passes through the floor or the aditus. Let us note that we may often encounter, as I have, the disposition represented in figure 21 where the facial F is, as it were, sculptured in its vertical portion up to the level of the angle which it makes with the horizontal portion. In this figure the horizontal portion is seen in a sort of tunnel, not in the floor of the aditus but much more internal.

The third portion, vertical, of the nerve canal descends in the anterior region of the mastoid behind the posterior branch of the tympanic ring, as can be seen in the figures. It traverses a lamina of compact tissue known to modern authors as the arched premastoid lamina, well described by Chipault.

The Arched Premastoid Lamina. This is what in figure 37, separates the two branches of the probe bent in the form of a hair-pin. The reader will find it in figure 24 (p). It is easy to understand the resistance which this offers to the passage of pus toward the auditory canal.

A Slightly Known Relation of the Facial. An intracranial relation of the facial which is, I believe, but little known, is that which is shown in figure 21. In its vertical portion, the facial F is separated from the jugular fossa by a band of tissue very often fragile and formed, as in the figure, of large air cells. The route of the facial being well known, what risk do we run of injuring it in antrectomy?

In children if we seek the antrum where it is found, that is to say high up, it is evident—and figures 12 and 14, where

the facial F is shown, make this clear—that trepanation is absolutely without danger to the facial. Once in the antrum, if we destroy the external wall of the aditus, we run no risk of reaching the angle of the nerve lying in the floor by striking the roof with a chisel.

In adults may we injure the facial in its vertical position in making a passage toward the antrum? Evidently not if we remain parallel to the arched premastoid lamina which shows the plane of direction, as has been said above.

The chisel cuts upon the anterior part of the opening should be parallel to the auditory canal, and should be kept a certain distance from it. In the depths, may we wound the facial at the level of its angle and of its horizontal portion? Evidently we must be on our guard for a certain depth. Noltenius estimates an average of 13 mm. as the distance separating the spine from the facial. When we know the position of the antrum, sometimes very deep, the non-dangerous zone may be much more extensive. But we may defy the rule even with an aditus at 10 mm. depth. The best precaution is not to trephine too low. If we consider figures 27 and 28, we see that trepanation practiced at the height of Henle's spine and following the line Ad passes above the bend of the facial, which presents there its tympanical arrangement. In all cases, as soon as an opening in the antrum is made, it is enlarged with caution until the aditus can be catheterized. At this moment the operator is master of the situation, since he knows where the facial lies.

THE LATERAL SINUS. We come now to the study of the relations of the sinus to the antrum and to the cavity which the surgeon is obliged to make in order to enter it.

I believe that there are few surgeons who in their career have not seen the lateral sinus opened. The accident itself, we know, is not of much gravity, the hemorrhage being arrested by tamponing; but the wound covered with blood or packed with iodoform gauze does not permit of search for the antrum. On the other hand, as the antrectomy may have in view the relief of a sinus or perisinus lesion, how can this aim be properly attained if we begin by wounding the vessels? Does an anatomic condition often exist from which it may result that a surgeon opens the sinus fatally while looking for the antrum?

Hessler reports four cases of caries of the middle ear in which the sinus lay in front of the mastoid antrum (he states that he found twelve cases in literature). In these four cases the texture of the bone was spongy; the dura mater was exposed to a depth of 2 to 4 mm. and the sinus incised. In all the cases the operation had to be stopped without having reached the carious focus. In spite of this, the results were satisfactory. Hessler is truly a happy surgeon!

Pauzat found that the sinus may be wounded in thirty out of a hundred cases by "penetrating deeply into the antrum." Does this mean that once the antrum is reached there is still danger?

But here is the opinion of other anatomists and surgeons.

In 100 preparations, Hartmann did not reach the lateral sinus but twice.

Ricard in his memoir, so exact from anatomic view, states that he did not encounter this danger but once in his preparations.

This is shown in figure 15, page 114, of his memoir. But still, it seems to me that if he had met with this case in the living he would have been able by carrying the chisel posteriorly to keep within the 12 mm. which in his specimen separated the posterior wall of the canal from the sinus.

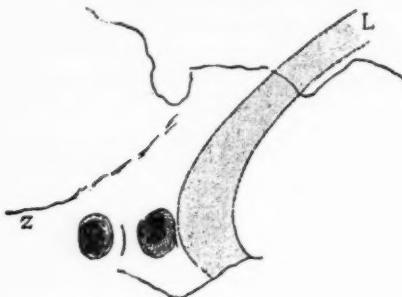
We know that Duplay reports a case of Politzer's in which the sinus was so convex anteriorly and externally that it separated the inferior from the superior part of the mastoid. In opposition to this case, I place the statistics of A. Broca—143 operations without opening the sinus.

The frequency of this operative danger has been the occasion of efforts made to determine in advance the position of the sinus. I shall not dwell upon the theory of Jones, who proposes his otoscope and a tuning fork as a means of discovering it. I pass over the less exact suggestion of Körner who thinks that the forward projection of the sinus is more marked in brachycephalics and on the right side. Macewen traces a vertical(?) line from the parieto-squamo-mastoid reentering angle to the apex of the mastoid. The superior two-thirds of this line should correspond to the lateral sinus.

Ballance places the bend of the sinus an inch posterior and a quarter of an inch above the center of the meatus.

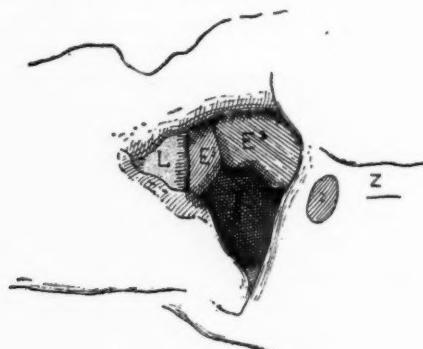
Chipault says: "The lateral sinus in its posterior or horizontal portion corresponds to the posterior third of a line uniting the inion with the retro-orbital tubercle."

Subject No. 8, boy, 3 years.



Left side.

Fig. 15. Simple uncovering of the antrum, which is 10 mm. deep. No mastoid cells proper. External table, 1.5 mm. thick; below, tissue diploie, very compact. Sinus nearest to the antrum of all subjects dissected.



Right side.

Fig. 16. Because of extensive lesions, the petrous has been completely taken away, only the apex remaining. It can be seen how easy it is to denude the lateral sinus and cerebral and cerebellar dura without injury. R, apex of petrous; L, lateral sinus; E³, cerebellar fossa; E², temporo-sphenoidal fossa.

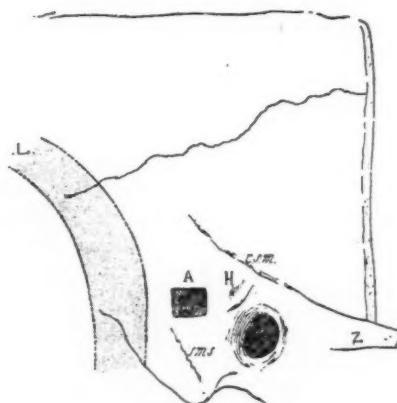
Ricard says, very properly, "The posterior half of the mastoid process is dangerous because of its vicinity to the

lateral sinus, but the danger diminishes proportionately as we leave the base and approach the apex of the mastoid." Nothing is more correct; the danger is only above. This fact becomes convincing when we examine the figures in which the course of the sinus is shown.

Unfortunately it is precisely on the horizontal plane of Henle's spine that the antrum is found.

Without pretending to give the measurements, the average of which might be valueless, in estimating an el-

Subject No. 6, boy, 5 years.



Right side.

Fig. 17. Simple uncovering of the antrum, which is 4.5 mm. deep. External table 1 mm. thick. Henle's spine rudimentary. L, lateral sinus; A, antrum; H, Henle's spine; csm, supramastoid ridge; sms, mastoido-squamous suture.

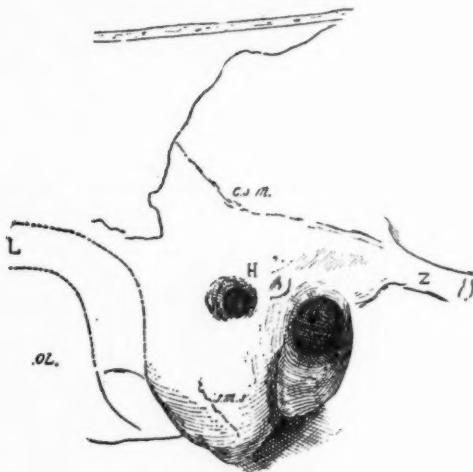
ement so valuable in individuals, we will examine our figures and see if we may draw any conclusions from them.

In the first place, I have never found, in examining a number of crania of all ages, a case in which an adroit surgeon could not open the antrum by passing in front of the sinus without wounding it. At most, in one case, stripping of the dura mater might have been necessary. Often on inspection the sinus has appeared extraordinarily convex anteriorly, yet when it was examined its relations were found normal.

In children of an early age, as the antrum is situated relatively far anteriorly, there is little chance of wounding it. Besides it seems very common for the bend of the sinus in these subjects to correspond to the antero-superior (parieto-temporal) angle of the asterion (see fig. 13 and 14). This is a landmark useful and easy to find.

The sinus of subject No. 7 (fig. 17), in spite of a marked bend, is a considerable distance from the antrum. The same may be said of figure 18.

Subject No. 7, boy, 13 $\frac{1}{2}$ years.



Right side.

Fig. 18. Simple uncovering of antrum, 11 mm. deep. External table 2.5 mm. thick. Henle's spine already recognizable. It can be seen how little the sinus is to be feared although its fossa is large.

Subject No. 8 (figure 15 and 16) is, of all those which I examined, the one in which the bend of the sinus was most prominent, so I have carefully measured it. The most anterior point of the sinus is still 5 mm. from the antrum. It is true that it is only 1.5 to 2 mm. from the posterior part of the opening made to enter the antrum. Finally the aditus may be catheterized by a bent probe without wounding the sinus. And in the living, by following the operative rules

given later, the dura mater would at most have been laid bare.

In adults, I have never found greater difficulty than in the case of figure 26 in which the sinus is faithfully shown. Consider figures 19, 20 and 24; do they not show conclusively that we may attack the mastoid very far back without wounding the sinus, upon the condition that we begin chipping and hollowing out the posterior part of cavity in a very oblique way anteriorly and internally? And this not only in petrous bones with a deeply excavated sinus, (fig. 24) but also in those in which the sinus lies superficially on the posterior surface of the bone (fig. 20).

In my opinion, by taking the precautions indicated above, it will always be possible, except in cases which I have not seen and which seem to me to be very rare, to operate on the antrum without wounding the sinus.

OPERATIVE TECHNIQUE.

The reader will doubtless consider this chapter curtailed; he will surely find repetition.

In the preceding pages we have tried to acquire an exact notion of the landmarks in order to learn the method to follow and the obstacles to avoid. Is this not the most important part of the operation, and these three conditions established, is it necessary to go into more minute details? I repeat, what follows is only the synthesis of the knowledge acquired in the preceding chapter.

The surgeon ought to be well equipped. What instruments should be used?

Choice of Instruments—Trephine or Chisel. I have no intention of tiring the reader by giving him a useless enumeration of instruments which should be at hand before undertaking the operation which after all is only an ordinary operation of bone surgery. But at the very least something ought to be said about the particular instrument for antrectomy which goes in search of pus. What shall it be?

The trephine, after having been employed very frequently, appears to-day almost forsaken. It does not appear to me that openings can be made deep or small enough upon all points, compared to the sure and prudent stroke of the chisel, which will be effective upon the hard-

est bone whether used to chip off pieces of proper thickness or held firmly in the desired direction.

But if the trephine has but few experts it is not the same with all perforating instruments.

Macewen employs a rotary drill; Green, the White's dental engine. The employment of these different instruments can evidently give rapid and excellent results in the hands of experienced operators. They do not, however, seem to offer the same guarantee as the chisel.

I repeat, it is necessary to chip away small portions so as to escape the sinus. What instrument is better for this than the chisel?

In this particular I am in accord with the majority of French surgeons. Ricard absolutely proscribes the perforator. Tillaux, Chaput and Chipault approve of the gouge, chisel and hammer. Gruening, cited by Duplay, says with reason: "What can be done with the different perforators can be done with the gouge, but what can be done with the gouge can not be done with the perforators."

We may, with stronger reason proscribe the use of a perforator such as that of Laurent. This instrument is composed of a hollow shaft bevelled at its cutting end. The shaft carries two canulae; the first, the larger, the canula of introduction, is provided with a plate which facilitates the action of the finger. The second, short, constructed with proper dimensions (a series of four is necessary) and provided with a stop-plate, is placed at the end of the first and surrounds the extremity of the shaft, leaving the cutting part free—this is the drainage canula. With the aid of this instrument Laurent makes a veritable trepanopunction. This seems to me operating in the dark.

Duplay employs two sorts of instruments, perforator and gouge or chisel. He thinks that for the surgeon who is still a novice, the use of the gouge and hammer is preferable, and that the dangers of the operation are less than with the different perforators.

It is not necessary to answer the argument of Buck (American Otological Association, July 20, 1886), who accuses the chisel of wounding healthy tissues and of causing a slower cicatrization.

I advise, then, the employment of the chisel, recommending one of slight thickness; thin chisels cut as well and

make fewer fragments. The size of the cutting edge for children is 4 to 5 mm. and 1 cm. for adults. These at least are the dimensions which are most favorable.

THE CUTANEOUS INCISION. Incisions of the greatest variety have been proposed. I mention those sanctioned by the best known authors.

Politzer makes an incision in the form of an angle, with the apex directed posteriorly, whose two branches pass to the upper and lower limits of the retro-auricular groove. Treves and Macewen carry the point of the bistoury from the apex of the mastoid to the base. These incisions seem defective in the sense that they permit the use of the hook only in front of the auricle. However, Ricard has ob-

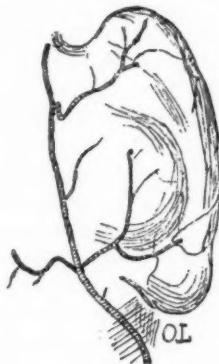


Fig. 18a. Posterior auricular artery.

served the utility of this procedure. Is not a part of the mastoid covered by the auricle? Is it not necessary to uncover Henle's spine? Schwartze, Hartmann and Duplay make an incision 3 to 6 cm. long, parallel to and 1 cm. behind the auricle. Poirier follows the groove of insertion, for a length of 4 to 6 cm.

After the example of Lubet-Barbon and Broca, I advise a line of operation quite close to the retro-auricular groove to a point 1 or 2 mm. from the fold, in order to facilitate suturing. The incision will pass around the superior portion of the canal toward the temporal fossa. In case of extensive disease, the incision may be carried far above and below. A. Broca afterward adds another incision per-

pendicular to the first. Save in exceptional cases he has given up this method.

The surface is shaved; the skin, especially that over the groove, very carefully disinfected; the auditory canal cleansed as well as possible. A stroke of the bistoury divides the skin, the subcutaneous tissue and the muscular and aponeurotic mass, from one end of the line of operation to the other.

At the time, the operator will divide the posterior auricular artery and its branches (fig. 18a shows the arterial system of this region, in one of my preparations,) Koch's forceps are at this moment useful, but I hold that the best hemostat is a retractor. Elevation of the periosteum is also an excellent means of arresting hemorrhage.

Often in the beginning of the operation, the surgeon sees hemorrhage from the emissary vein of the posterior part of the mastoid, a venous hemorrhage generally of slight importance. Chaput has obliterated the orifice with the thermocautery point.

The integument being divided, the periosteum will be elevated in front and above without difficulty. Below and behind, we know that the instrument may be arrested by a strong attachment of the periosteum. This circumstance is favorable; it indicates the mastoido-squamous suture, anterior to which we should operate. Already in the upper part of the wound the finger and the eye recognize the supramastoid ridge; below this we should work.

It is well at this stage to elevate the tissues over the posterior semicircumference of the cartilaginous auditory canal, especially above. Then the auricle draws upward and we are upon the mastoid surface—where shall we attack it?

THE POINT OF ELECTION. To be sure, in what follows, I do not refer to cases in which young children are affected. I have already described in great detail the position of the antrum in this period of life, so we thus avoid a tedious repetition. I shall only consider adults, adolescents and older children.

Before considering the point for the opening to be made, it will doubtless be instructive to relate some of the opinions which have been and are still held to-day.

J. L. Petit, whose name is linked with the history of trepanation of the mastoid, opened it at the painful spot. Af-

ter him the operative indications were wanting for some time as the operation had fallen into disuse. However, in the present period, the procedures are numerous.

Richet, in his treatise on topographic anatomy, furnishes us with no precise information, doubtless because the question was not the order of the day. One of the first theses on the subject, cited by all writers who treat of the mastoid is that of Délaissement. We will not dwell upon it. The author, in effect, advises the opening of the mastoid at the nearest point possible.

Ganjot (Pauzat's monograph) performs trepanation at the level of the superior border of the auditory canal, 1.5 cm. back of the auricle.

Mitskommer uses as a landmark "the fossa which is found above the mastoid process, below the temporal line." What does he mean by that?

Parisot trephines 10 or 15 mm. behind the groove at the level of the superior border of the auditory canal. After what has been said in chapter II, this seems dangerous both to the brain and sinus.

According to Macewen, "The opening ought to be made at the posterior part of the triangle which I call the supramastoid, and which is bound by the horizontal root of the zygoma, the posterior part of the osseous auditory meatus, and a base uniting the two preceding lines."

Hartmann and Bezold perform antrectomy below the temporal line as high as the superior portion of the auditory canal, about 7 mm. behind Henle's spine. This seems proper, though the height of the incision seems rather better suited for children of ten years than for adults.

According to Duplay, we should take as the upper limit of trepanation the superior border of the auditory canal, and for the anterior limit the exact point where the mastoid plane bends forward to unite with the posterior wall of the canal. This is approximately the plan which I have adopted.

Poirier trephines on the level of the external auditory canal immediately below the supramastoid temporal ridge.

Cavoraz (Pollossen's plan) appears logical in proposing to operate 7 mm. below the temporal line and 8 mm. from the level and back of the spine. He is wrong, in my opinion, to except a case "where the pus has descended"

and to advise trepanation then at the painful point. I believe that if there is pus in the mastoid, the surgeon should open the antrum with deliberate intention. The pathogenesis of mastoiditis is not contradictory to this view.

With regard to the posterior limit of the opening, we observe that Schwartz, Zuckerkandl and Ricard set the mark a little less than 1.5 cm. behind the canal.

Subject No. 11, man, 25 years.

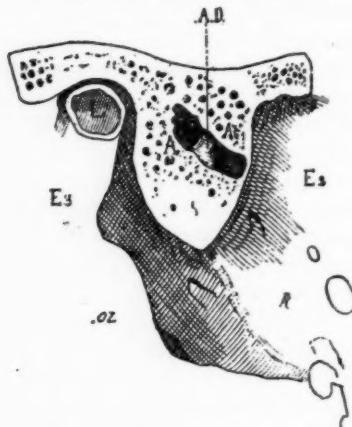


Fig. I9. Horizontal section through the antrum, aditus on the inferior wall, attic where the anvil whose short process lies in the aditus is seen. Bony canal of lateral sinus, well marked. It can be seen how one may attack the surface of mastoid quite far behind and pass into the antrum without wounding the sinus by conforming to the operative rules given. A, antrum; AD, aditus; At, attic; L, lateral sinus; E₂, middle fossa; E₃, inferior fossa; R, petrous.

We have cited the opinions of anatomists and surgeons —have the mass of practitioners ignored the point of trepanation? Ask the first student you see, he will answer without hesitation, that one ought to operate in the antero-superior quadrant of the mastoid process. This is all beautiful and good, but if we consult the treatises upon the subject, we will not find an excessive clearness in the description of these famous quadrants. Thus in Chippault's most remarkable book we read. "If the mastoid process is divided into quadrants by a vertical and a

horizontal line." But where does the horizontal line pass? And the vertical line? All books present in its place a direction of the mastoid corresponding almost to the squamomastoid suture. We must add that Chipault is more exact when he describes the antero-posterior quadrant in detail.

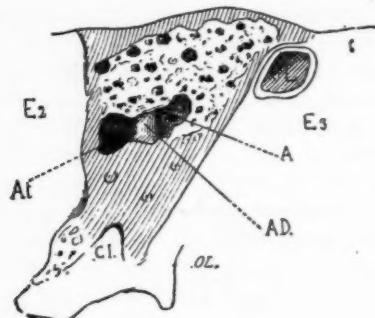
"The retromental surgical triangle is a smooth surface bounded by easily appreciable variations of the bony surface; behind and below is the vertico(?) - mastoid ridge or groove, obliquely below and in front and terminating above the mastoid tip often immediately below the inferior border of the osseous meatus; above is the horizontal supramastoid ridge prolonged from the superior border of the zygomatic process; anteriorly is the posterior-superior border of the bony canal with the suprameatal spine of Henle." This is almost a perfect point of election.

The formula which I give is that adopted by A. Broca. This surgeon begins by cutting a small square of 5 mm., 5 mm. behind the canal, above the horizontal line passing through Henle's spine.

These are the rules which, from my investigations, protect the surgeon from all danger. We know that in adults the center of the petrous antrum is found at most 7 mm. behind Henle's spine, and upon the horizontal line passing through this landmark. It is of little importance to enter at the exact mathematic center; it is even preferable to strike the superior portion of the antrum; the aditus will be easier to catheterize and being high up we run less chance of wounding the horizontal portion of the facial. We then make the lower plane of the opening at the level of Henle's spine or slightly below the horizontal line passing through it. Logically, since we wish this opening to be 1 cm. on each side (the ordinary size of the cutting edge of the chisel employed) we should make the anterior vertical cut 7-5 or 2 mm. behind the supra-meatal spine. But I do not make this too near the arched premastoid lamina, which is the landmark indicating the direction of the vertical portion of the facial; therefore I trace this side of the opening 5 mm. behind the spine. The top of the opening will be the length of the cutting edge above the floor, in all cases below the supramastoid ridge. With regard to the posterior vertical cut, it is carried 5 + 10, or

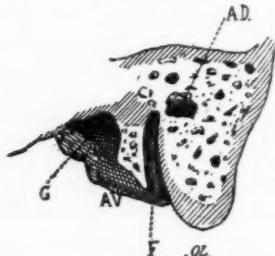
15 mm. back of the spine. In truth, if we enter deeply from this point on the surface of the bone we may some-

Subject No. 10, 47 years.



Right side.

Fig. 20. Horizontal section. At, attic; AD, aditus; A, antrum; L, lateral sinus; E₁, middle fossa; E₂, inferior fossa; CI, internal auditory canal. External table 1 to 5 mm. Antrum 16 mm. in depth. Process pneumatic.



Right side.

Fig. 21. Frontal section. Posterior view of anterior section. AD, aditus; F, aqueduct of Fallopius; G, jugular fossa. The height and form of the aditus can be seen. Note that the transtympanic portion of the aqueduct is not in the floor but 1 mm. below and 3 mm. behind (frequent state of affairs). The canal F is only separated from the jugular fossa by some very thin pneumatic cells (a topographic point seldom noted). AP, vaginal process.

times touch the sinus but, I believe, this danger will be avoided if the chisel be given the proper direction while working in the depths.

In adults we must trephine below the supramastoid ridge anterior to and above the mastoid-squamous suture, behind the auditory meatus.

The opening made in the external table will have the form of a square of 1 cm. to the side, the base being slightly below, also at the level of the horizontal line passing through Henle's spine and the anterior vertical cut 5 mm. behind this eminence.

It is evident that in children according to age, the dimensions of the opening should be less. In all cases the center of the opening should be rather higher and more anterior the younger the subject, while the operator should keep within the limits established in chapter II.

THE ROUTE TOWARD THE ANTRUM. We have taken away the little square from the external table of the skull and we are in the presence of the mastoid cells. How shall we find the way to the antrum?

In the first place, let us not forget that if we find disease of the mastoid cells proper (we have explained what this expression means), it is to our interest to treat them immediately, inasmuch as this plan of action can be of assistance to us, both as to time and space. In figures 25, 26, and 27 the entire external table of the mastoid has been chiseled away before attacking the antrum. There is no danger from this and the operative field is enlarged. Let us return to the cavity made. If we have the good fortune to meet with the condition described under the name of *aditus externus*, nothing will be easier than to introduce the probe through the natural passageway. As already stated this is far from being constant. I shall endeavor, therefore, to establish for all cases the general direction of the passageway to be made and the direction of each of its walls.

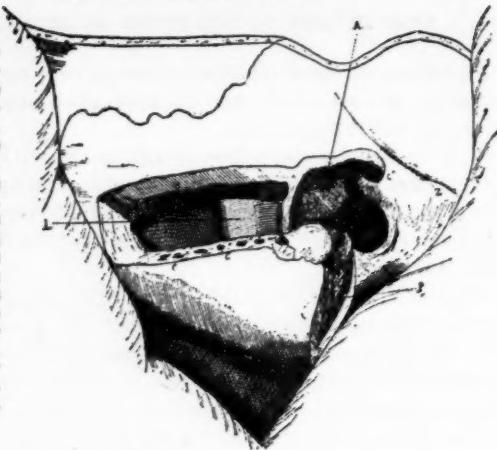
An excellent rule is that given by Farabeuf in his manual. "The operator guides his instrument along the line of the eyebrows, which indicates a plane parallel to the base of the cranium, aiming at the temporo-maxillary articulation which lies upon the pillow."

Ricard advises that the opening be directed very obliquely forward as if to reach the auditory canal. Duplay says, very properly in my opinion, that one must follow as closely as possible the direction of the posterior wall of the

Subject No. 5, man, 75 years.

Right side.

Fig. 22. Apophysia sclerosed in the mastoid portion proper. External table 4 to 5 mm. thick. Antrum 2.7 cm. deep. Numerous petrous and squamous cells. It is seen how easy it is to denude the dura mater and sinus. Atticotomy has been combined with antrectomy.



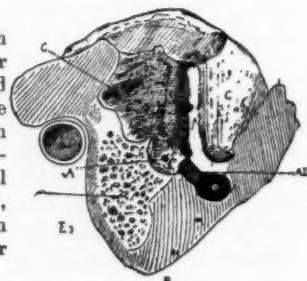
Left side.

Fig. 23. Sclerosed mastoid. Antrum 2.7 cm. deep. By reason of the thickness of the external table, the mastoid cells proper were reached only by the holes P in the route to the antrum.



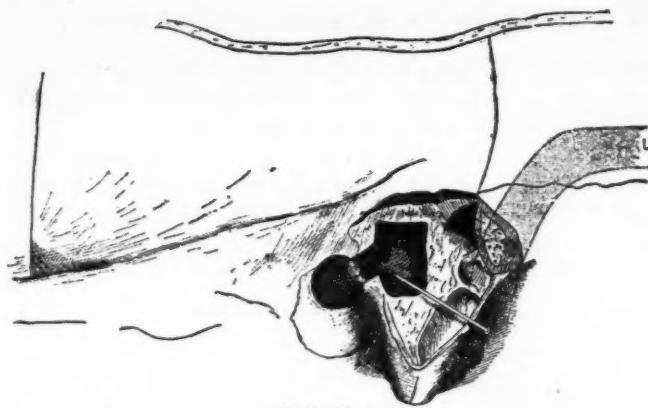
C. Left side horizontal section.

Fig. 24. This section passes through the antrum, aditus and attic, near the head of the malleus. Behind the premastoid lamina p may be seen the route traversed to reach the antrum. Because of the presence of cells back of and internal to the antrum, it is seen how easily, in this subject, inflammation might have reached the cerebellar fossa.



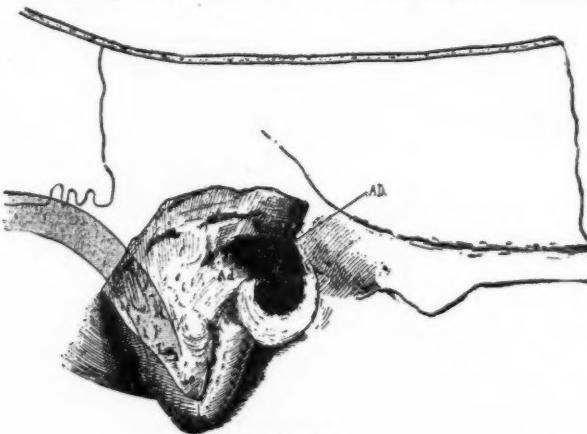
General key for the three figures above:

Z, zygoma; A, antrum; P, cells of the apex; C¹, squamous cells; C, petrous cells; L, lateral sinus; H, spine of Henle; cms, supra-mastoid suture; csm, supra-mastoid crest; p, arched premastoid lamina; AD, aditus, At, attic; C, auditory canal.



Left side.

Fig. 26. The antrum has been opened at a depth of 2.5 cm. following the direction of the pin. The lateral sinus is 8 mm. distant from the posterior cut. The wall of the aditus is destroyed.

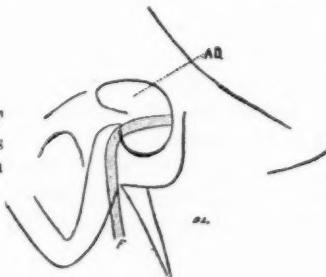


Right side.

Fig. 27. On this side atticotomy followed antrectomy. Like the other side, the apophysis is pneumatic, and the antrum is 2.5 cm. deep.

Right side.

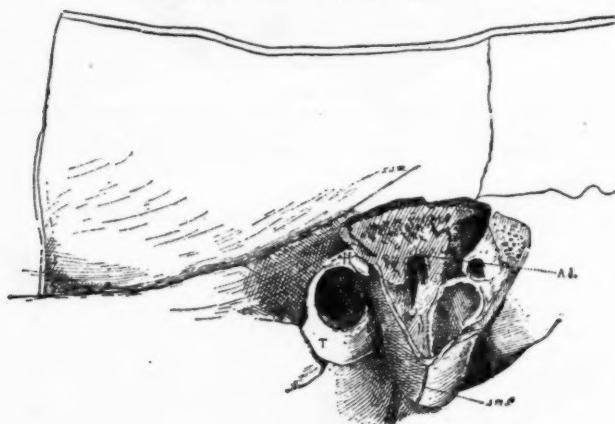
Fig. 28. Same side, facial F shown, exact size; it is seen that the facial has run no risk.



bony canal. In order to determine what direction is to be followed, A. Broca introduces a sound into the meatus, a procedure which is simple, easy and exact.

The greatest precision is observed in the landmarks outlined by Farabeuf. If the reader will refer to figures 29 and 30 which have been borrowed from this writer, it will be seen that a sharp probe thrust into the deep portion which passes down from the superior wall of the osseous

Subject No. 4. Woman, 60 years.



Left side.

Fig. 25. The chisel having been used glancingly has, so to speak, peeled the mastoid, which is pneumatic with great bullous cells. These cells are divided into two groups by an indistinct demarcation which takes the same direction as the squamo-mastoid suture. *Ad*, route to the aditus; *csm*, supramastoid suture; *H*, spine of Henle; *T*, tympanic ring; *Ad*, aditus externus; *L*, lateral sinus; *F*, facial; *AD*, aditus ad antrum.

canal enters the aditus. If then we introduce from time to time into the auditory canal a director which is to rest at the point indicated above, we have, any time we wish in the course of the operation, the direction to be followed as shown in figure 30.

It is this route which the little curette should follow in obliterating the cells. However the hammer and chisel may or will be necessary. In a general way I recommend

that the chisel be firmly held with the whole hand, using the cranium as a support, and that it be struck without much force, with the right elbow resting upon the body.

What should be the direction given to the chisel in working on this or that wall of the canal? Anteriorly we have taken the distances so as to save the arched premastoid

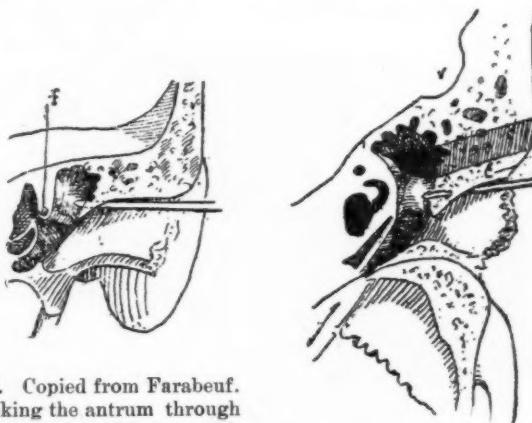


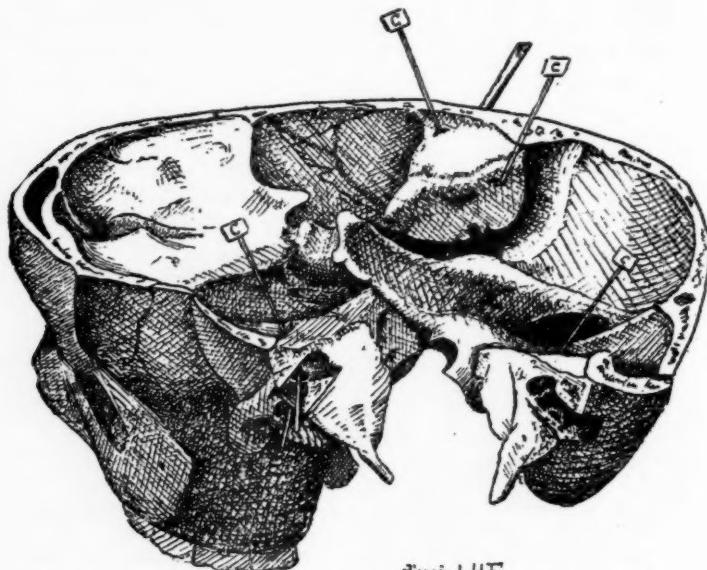
Fig. 29. Copied from Farabeuf. Attacking the antrum through the external auditory canal. The drawing shows, on the posterior part of the section, seen from in front, how the floor and roof of the external auditory canal bend downward in approaching the tympanic ring. The perforator has been pushed into the internal opening of the aditus, above the floor, in which the facial F descends. Deep in the aditus is the darkened cavity of the antrum, within the hard shell of the canal (Farabeuf).

Fig. 30. Copied from Farabeuf (horizontal section). View from above, passing very near the roof of the auditory canal, the inclined portion of which has been retained in front and behind. As in the other section, the perforator is seen to reach the aditus behind which is the antrum. The opening to be made is shown; even if it were enlarged as desired the lateral sinus v would not be endangered (Farabeuf).

lamina, and we cannot do better than to follow the general direction toward the antrum indicated above.

Behind we must avoid the sinus. In this region the chisel must be used with great circumspection. In order to avoid the sinus, the instrument should be directed very obliquely anteriorly and internally, as if to strike the auditory canal.

Above, the danger comes from the proximity to the middle fossa, the floor of which may be abnormally low, on account of which it will be well to direct the chisel inward and below.



d'après LHT

Fig. 31. This drawing was made from specimens and a fine plat of Prof. Faraboeuf, at which I worked. There is shown the manner of cutting the passage from the mastoid surface to the antrum. A curved probe passes from the antrum into the aditus and comes out through the external auditory canal. Penetrating probes show the manner of perforating the walls of the petrous in order to get into the cerebrum C or the cerebellum c.

In this subject (No. 9, about 70 years) the right side is shown; apophysis pneumatic, external tube varying from $\frac{1}{2}$ to 3 mm. Spine well marked. Antrum at 17 mm. depth at the height of the spine and 6 mm. behind it.

Below, we have taken all precautions to avoid the facial, however, for the sake of prudence the chisel should be diverted slightly upward; there will be ample time to enlarge the opening without incumbrance after the antrum is opened.

After having expressed these rules I can do no better

than to refer the reader to figure 31 which shows the passageway, in extenso, to be followed in antrectomy. The last cell is broken open and the antrum has been opened without wounding any organ. However, there may be other complications of otitis media to treat besides pus in the antrum.

I shall endeavor in the following chapter to show how the work already done facilitates the surgical therapeutics of its complications.

IV.—THE FACILITY AFFORDED BY ANTRECTOMY IN THE TREATMENT OF THE COMPLICATIONS OF OTITIS MEDIA. TREATMENT OF SUPPURATION OF THE ATTIC. ATTICOTOMY COMBINED WITH ANTRECTOMY.

I will consider first the opening of the aditus and the treatment of the attic in cases where the ossicles and drum are irremediably lost. In truth, the same thing ought to be brought forward with reference to antrectomy in almost all the operations directed against old otitis; and in not adding to the preceding chapter the technique which follows, I have had the purpose of not overburdening it in view.

Denudation of the osseous auditory canal. Opening of the aditus should be preceded by enlarging the passage made and by denudation of the osseous canal. The operative technique here given is taken from Stacke's practice, perfected by Lubet-Barbon (Thesis of Weismann).

"The periosteum having been elevated as far as the auditory orifice, the postero-inferior part is freed, then the posterior, finally the superior part up to the muscular fibers of the temporal. In this way three-fourths of the osseous meatus is visible as far as the border, to which the cutaneous auditory canal and periosteum adhere. The separation of the soft parts from the hard parts is continued by introducing a fine blunt curette gently and carefully into the auditory orifice between the deep surface of the skin of the canal and the osseous canal.

The periosteal-cutaneous investment should be freed from connection with the bony canal as deeply as possible, that is to say, up to the point near the tympanic membrane where the investment is so thin that it can no longer be raised without being torn.

The membranous canal is then cut below, behind and above, as close as possible to the raised extremity, by introducing a bistoury obliquely into the depth of the osseous canal. This section opens in three directions the membranous canal, which is only adherent to the osseous canal before and below. The auricle is then drawn forward by an assistant, the membranous canal is retracted by the auricle, and the cut posterior and superior walls being removed, the anterior wall of the auditory canal is seen.

The anterior wall is severed by a stroke of the bistoury which joins the two extreme points of the preceding section; the cutaneous canal is thus cut upon its entire circumference, but it is not denuded in its anterior and inferior portion. Introducing then a fine curette along the surface of the section of the anterior wall, the soft parts are pushed away until the anterior and inferior border of the external auditory meatus is reached. Separation of the cartilaginous canal from the bony canal is then complete.

The auricle is drawn strongly forward by a retractor which holds at the same time the membranous canal and the elevated periosteum. The operator finds the bony canal clear of the soft parts as in the skeleton."

We have now before our eyes the tympanic cavity, most often deprived of its membrane in the cases with which we are concerned. The hammer, if it is necessary, may be removed and the operator, introducing a bent protector into the cavity behind the depressed portion of the roof of the bony canal (external part of the attic) will, without danger, break the bony lamella with slight strokes of the chisel. The incus will then be easily removed.

At this time the cavity and the meatus form only a single canal and the ossicles having been detached, it is proper for the purpose of dressing to unite this cavity with that furnished by antrectomy, and to destroy the whole external wall of the aditus.

At the place where the short process of the incus is found (fig. II) a probe thrust into the aditus through the tympanum gives the direction of the canal. Replacing this probe by a bent protector and directing the chisel toward it after the manner shown in figure 7, we may, without

danger to the facial which lies lower, and without danger to the semicircular canal, make a large communication between the antrectomy and atticotomy, being guarded by the protector. Nothing is easier than to remove the diseased portions and to apply the dressings until recovery takes place. (See operative result obtained, figure 27.)

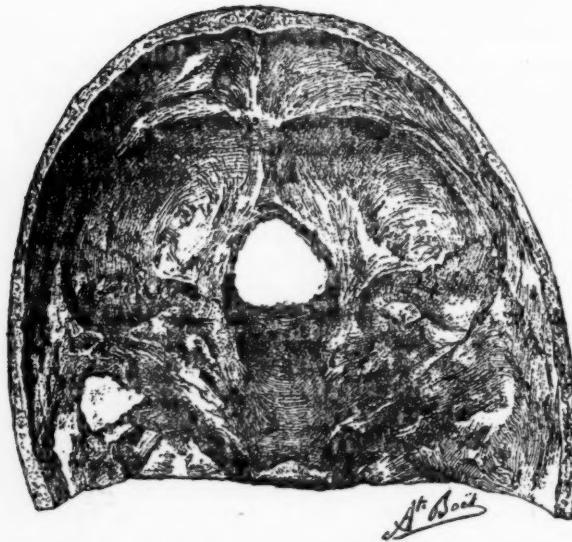
I do not dwell upon the method by which the bony cavity thus made may be epidermized. I have given in detail the method of including cleansing of the attic and of the tympanum with antrectomy, preferring in a general way the operative method which I have described to another applicable in certain cases, which consists, after opening the antrum, in catheterizing the aditus from behind forward and in immediately destroying the external wall. This second procedure seems to me more dangerous than the first.

I pass to the therapeutics of other invasions resulting from infections in the middle ear.

CLEANSING OF THE CELLS. In the course of the operation technique of simple antrectomy, I have indicated the opening of the mastoid cells proper. But pus usually invades (the operator should not forget it if he wishes to do a complete operation) the squamous and petrous cells.

Of all of my preparations, figures 25, 26, 27 and, above all, figure 23, which I invite the reader to study well, are those which make it possible to understand the method by which the surgeon should operate upon the antrum with this special point in view. It can be seen that it may be necessary to chisel large furrows on the surface of the mastoid in order to pursue the infective agent to its last retreat. Nothing is less dangerous when the antrum is uncovered, for it is not essential to go in deep. Once the external table is removed with the chisel held almost parallel to the surface of the bone, the remainder of the work may be done with the curette by small cuts and with such security that it is easy, as in figure 22, to lay bare a large surface without wounding the dura or the walls of the lateral sinus.

TREATMENT OF THE SINUS AND PERISINUS LESIONS. The technique consists in first finding the antrum, the primary source of the disease, and, starting from this point, denuding with a curette or chisel carefully handled, the



Figs. 32 and 33. These drawings show how easy it is after the antrum is opened to penetrate into the middle fossa by breaking through the tegmen tympani.

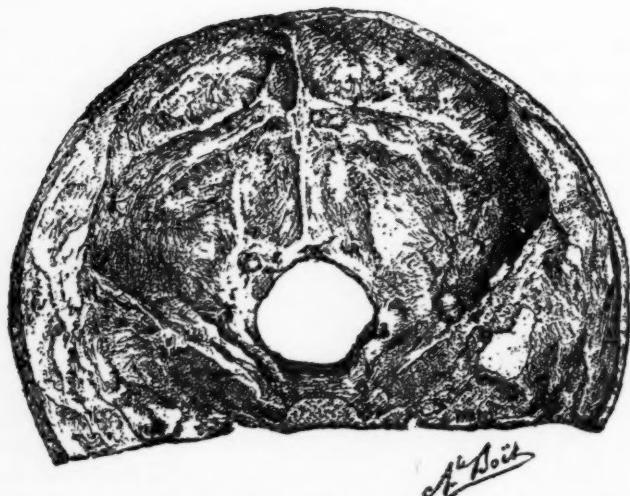
dura bordering upon the sinus. This seems the most rational and easiest method. Later I will discuss other procedures. It might be considered that when we are looking for such a large vein it is better to approach it horizontally than perpendicularly. However, I repeat, nothing is easier than to obtain the result shown in figure 22, which seems to satisfy all desiderata. When the sinus is uncovered in this way, it is easy to open the purulent collection which has developed around it, or to open and cleanse it as advised and done in those modern days.

I do not wish to tarry longer upon facts which my figures show better than discussion.

TREATMENT OF CEREBRAL AND CEREBELLAR COMPLICATIONS. Finally, does antrectomy make it possible to reach cerebral and cerebellar pus collections resulting from otitis? I shall return later to the question as to which procedure is the best; all that I can show now is that it is good and easy.

Figure 31 shows in a clear way how and by what route the probe, starting at the petrous antrum, may, following the direction imparted to it, penetrate the middle fossa C from the base of the cranium toward the brain, or the posterior fossa c toward the cerebellum. Figures 12 and 13 show with what ease in young children a simple pin properly directed may be thrust into the temporo-sphenoidal lobe C' or into the cerebellar hemisphere c".

Once in the antrum, in order to make a sure path toward the cerebral and cerebellar collections resulting from otitis, it will be sufficient to break open the tegmen tympani in the first instance and in the second, the wall separating the posterior wall of the antrum from the posterior endocranial surface of the petrous. We know that the tegmen is thin, offering slight resistance to the point of a grooved director. With regard to the posterior wall of the antrum one of two things happens: it is either very thin or formed of cells of slight consistence and justifying the use of the curette (figures 20 and 24). In all cases, the chisel properly handled is inoffensive in practice; and I use it in the most unfavorable conditions, namely, when there is softened bone between the antrum and the cerebral lesion. In the majority of cases, in fact, sequestra are present; the wall is friable, perhaps too much so.



Figs. 34 and 35. These drawings show how it is possible, according to operative rules laid down, after having done antrectomy, to penetrate easily into the middle or posterior fossa, toward the sphenoidal lobe or the cerebellum.

From a practical point of view, a better demonstration of these facts could not be given than by commenting on figures 32, 33, 34 and 35 borrowed from Broca. In the first two, it is seen how after antrectomy has been done the tegmen can be destroyed so as to permit exploration of the brain. In figures 34 and 35, two openings, one before and the other behind, give all facilities desirable for the treatment of cerebral and cerebellar pus collections.

V.—CRITICAL EXAMINATION OF OTHER METHODS EMPLOYED FOR OPENING THE ANTRUM AND FOR THE TREATMENT OF CERTAIN COMPLICATIONS OF OTITIS MEDIA.

Although I have designed this monograph to serve only as a commentary upon my figures, I think it useful before concluding to review some of the procedures employed to-day to reach the antrum or to treat the intracranial complications of otitis media.

Stacke's operation is much in vogue at the present time; it permits dressing of both antrum and attic. I have borrowed from this author the method by which the bony canal is divested of its soft parts and I have been inspired by his technique in making a broad communication of antrum and attic. The final result is then almost the same as in the method proposed by me, but the order is reversed. Everyone recognizes that the operator may be obliged in certain cases to approach the antrum through the aditus, in place of entering from without. Still I think that in the majority of instances the surgeon should begin with an antrectomy.

The reasons are simple enough. What does the operator do in performing a Stacke? He breaks down the wall of a canal whose entrance he sees, but whose end he does not see and whose direction he does not know. Do you not think that under these circumstances there is more danger of wounding the facial than in the other procedure where the surgeon sees the probe enter the aditus through the attic and come out through the antrum? On the other hand, the attack upon the canal seems to aim at the attic, the tympanum and ossicles as the prime purpose—this is particularly the plan of the otologist. The attack upon the mastoid such as I have described aims at the antrum and gives light upon the treatment of the cells (with which the Stacke seems little concerned) and the inspection of brain

and sinus. This is particularly the plan of the surgeon.

Küster proposes to remove the posterior part of the bony canal in order to establish a communication between canal and antrum. And the facial? It is, moreover, through an analogous method that Hammond had three cases of facial paralysis in three operations.

Bergmann, on the contrary, seems to fear a nerve lesion in proposing the following technique, which is reproduced as he gives it. He opens below the temporal ridge with a straight chisel, across the strong osseous bed which lies between the roof of the meatus and the inferior and latter border of the middle fossa of the cranium, as far as the osseous border of the tympanic membrane, without opening the cranial cavity. Then he directs his chisel further behind toward the mastoid process, in order to enter from that point very obliquely into the tympanic portion forming the posterior wall of the bony canal.

Among the procedures directed against extensive caries of the mastoid process, I must mention that which is due to Chaput and called by this writer, "resection of the petrous."

This beautiful operation, cleverly conceived, seems to require an operative qualification and knowledge of anatomy which the practitioner is far from possessing ordinarily, and which in my opinion he can only acquire with difficulty, even by repeating this delicate operation many times. In my opinion it requires the attention of an expert trained for a long time in the great difficulties of bone surgery to conduct such a task. In the opinion of Chaput himself the operation is not without danger.

Practiced by an operator as experienced as its author, it has been followed by facial paralysis in three cases. In fact, in this operation the facial is constantly menaced. In the second stage of the operation (the first is the cutaneous incision), which is the resection of the superior wall of the canal and tympanum, Chaput found that there is danger to the nerve. In the third stage, the author isolates the nerve with a grooved director as far as the mastoid foramen.

I have myself detached the trunk of the facial several times in the amphitheatre—it is not easy to do. Finally, I must consider as dangerous, although very elegant and se-

ductive, the fifth stage (resection of the inferior wall of the canal and tympanum) in which the bone being very brittle a large fragment is always detached, consisting of the entire inferior portion of the petrous, the styloid process, the vaginal process, the enclosures of the bulbus jugularis and of the carotid; sometimes at the same stroke, the spine of the sphenoid.

This procedure aims to leave only the apex of the petrous. But with my technique the same result is attained (figure 16 drawn after a specimen belonging to Broca) without incurring so much danger.

I have insisted on this fact, that the treatment of cerebral and cerebellar abscess of attic origin, by the antrum, is good and easy from the standpoint of technique; although the question of cranial trepanation in these cases has been recently treated and solved by high surgical authorities, I will be permitted to state succinctly the major reasons which seem to me to favor the adoption of the mastoid route.

Most frequently brain abscesses of otitic origin are close to a diseased petrous and on the same side.

In the greatest number of cases in fact, they are temporo-sphenoidal (especially in children) sometimes cerebellar, rarely situated outside of these common sites.

There is a considerable variety in the methods of trepanations. All promise success, which shall be chosen?

In a general way, trepanation should be performed above the ear and mastoid to explore the temporal, and in the occipital fossa to explore the cerebellum.

Where are we to operate when diagnosis is impossible, as often happens? Certain writers pretend it is always so; in all cases or in the majority of cases, psychomotor signs are absent.

If trepanation is made for the cerebrum and error results, will a second intervention be necessary?

The diagnosis is not always certain between abscess, phlebitis, meningitis and subdural abscess. Is it not evident that these last three are to be treated by antrectomy?

Cranial trepanation does not permit good drainage. Finally, since it is always necessary to look after the petrous, the source of the disease, why not commence by properly attacking the source? I do not believe that there

is much value in the argument that concussion of the brain results from the strokes upon the mastoid.

I repeat, this plan already mapped out by MacEwen has the sanction of good operative results in its favor.

CONCLUSIONS. My conclusions will be summaries, based on facts established by investigations and preparations which I have constantly brought to the reader's attention.

The operative technique of opening the mastoid antrum merits study which it has not received as to children, and because most authors differ as to the method of intervention in adults.

Antrectomy is an easy operation because:—

1. It is easy to establish certain landmarks and to fix a point of election.

2. It is relatively easy, in performing the operation, to avoid wounding any important organs.

It is a useful operation in that it permits the opening of the antrum and efficacious intervention in all complications of otitis media.

The mastoid route appears the best of those proposed for the surgical therapeutics of the intracranial complications of otitis.

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IX.

HYSERICAL MUTISM IN HISTORY.*

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TRANSLATED BY ALBERT MILLER, M. D., ST. LOUIS.

The history of hysteria, from a literary point of view, has been enriched during the last seventy years by a mass of extremely interesting material.

Calmeil, Littré, Charcot, Bourneville, Paul Richer, Gilles de la Tourette and many others have brought to light, in an admirable way, the manifestations of the great neurosis in times past. As a result of their work, the improbable maladies, the epidemics of hystero-demonopathy, the miraculous cures, which for centuries have defied their contemporaries, appear to us as nothing more than pathologic instances of the hysterical proteus.

Among the phenomena of this character, mutism is rarely mentioned. "Considering the great number of patients, both men and women, attacked with hysteria," says Cartaz† in his excellent monograph, "it can be said that mutism is a relatively rare phenomenon. It is hardly mentioned in the old works. . . . If it were looked up in all the observations of hysterical neurosis and sought for in historic documents, certainly a much greater number of cases would be found corresponding to this clinical syndrome."

According to Landouzy,‡ Hippocrates saw hysterical mutism. "The wife of Polemachus, having an arthritic affection, felt a sudden pain in the thigh, her menses not

*The instances related here do not have the value of medical observations; very important details, necessary for us to know to make a retrospective diagnosis, are wanting. My sole object is to record a few interesting cases prior to the Nineteenth Century, which can be considered in all probability as hysterical syndromes.

†Cartaz, *Du mutism hysterique*, (*Progrès Médical*, 1886).

‡Landouzy, *Traité de l'hystérie*, 1846.

having come on. After drinking the water from beets she was voiceless all night and until midday; she heard and understood, and indicated with her hand that the pain was in the thigh."*

Most of the classic treatises cite the story of the son of Croesus, recounted by Herodotus. Croesus had a son endowed with the most brilliant qualities, but mute. All remedies were powerless to cure him. Now, Croesus, having been defeated by Cyrus, was about to be beheaded by one of the victorious soldiers, when his son, terrified by his father's danger, suddenly recovered his voice, crying out: "Soldier, kill not Croesus!"†

Valerius Maximus makes mention of a wrestler, named Eglis, on the isle of Samos, who was mute. Following a victory, the prize for which was unjustly refused him, he was so indignant that he burst out with bitter recrimination, to the great surprise of all who knew his infirmity. Thenceforth he continued to have the faculty of speech.‡

I have searched the works of authors of the 16th, 17th and 18th centuries for cases which might be connected with hysterical mutism. The books of the 16th century do not furnish any interesting facts upon this subject. The work of Ambroise Paré, so rich in medical curiosities, offers nothing of remark.

In the 17th century we find a limited number of important observations. One of them seems so interesting that I quote it in full. It relates to a man attacked with hysterical deaf-muteness, a very rare affection according to Gilles de la Tourette, who says: "Cases of hysterical deaf-mutism are few, since Lemoine, who was ignorant of Mendel's case, appears never to have met with it in the literature."||

LOSS OF HEARING FOR TWO YEARS; LOSS OF SPEECH FOR FOURTEEN
YEARS; SUDDEN RECOVERY.

"We cannot praise two highly the work of the Almighty as it is exemplified in the human body; for although it is

*Hippocrates, Epidemics, Book V.

. †Herodotus, Book I.

‡Valerius Maximus, Book I, Chap. VIII.

||Gilles de la Tourette, *Traité clinique et thérapeutique de l'hystérie*, tome II.

subject to numerous and chronic affections, God knows how to cure them suddenly and unexpectedly, when it pleases Him. We have a striking instance in the following observation which a physician, a friend of mine, learned from his brother:

"A peasant, aged 40 years, called Gilbert, became deaf and mute. As the poor fellow was no sluggard, a widow, who was slightly hard of hearing, took pity upon him and installed him in her home to work there. He liked to be busy, and scrupulously did all the work about the house.

"After two years of work and affliction, one day while digging a ditch, he heard the sound of a bell, which he made known to his comrades by tapping with his fingers. From this time on he continued to hear very well.

"Twelve years afterward, having gone out with one of his companions on April 12, 1680 (Palm Sunday), a house servant closed the door of his room, supposing that he was in and had retired. Coming in late and finding the door closed, he went to a neighboring house and lay down in a hay-mow. He was asked to awaken the domestics early Monday morning to go to market. Gilbert, lying in the granary, heard a voice, as he relates, or dreamed that he heard these words: 'Gilbert, arise and speak.' He arose and going to the door of the house where he was, knocked three times upon the door without a response. He then went to his mistress' door; the servant being awakened asked who it was. 'It is Gilbert. God has given me speech.' The girl, thinking he was some prowler, would not open the door and he was obliged to return whence he came. The woman of the house, who had arisen to go to market, heard a noise at the door, ran there, and, hearing a name which she recognized, said: 'It is you, Gilbert, and you speak.' Embracing her, he replied: 'God has given me speech, may he be praised and glorified!' The woman was so astonished that she could not talk. But, recovering from her surprise, she asked him how it was that he had recovered his voice. He related what had happened. The time for the woman's departure having arrived, Gilbert went to her husband to acquaint him with his good fortune.

"Gilbert married the servant with whom he had lived so long. He became valetudinarian, living but a short time after his marriage. He died in March, 1681.

"It is impossible to doubt the veracity of this story, since, if necessary, a hundred persons will attest its truth."*

No one will doubt the good faith of the observer, but it is not necessary to have an intervention of the deity to produce a cure, however extraordinary it may appear. The peasant Gilbert was probably attacked with hysterical deaf muteness, then muteness. Attacks of this nature may be prolonged for years without leading to any organic change. Then suddenly, one day or another, under the influence of a lively emotion, a traumatism, vexation, or some unknown cause, they disappear instantly leaving no trace. Here, the cure seems to have followed a dream, as it does sometimes. Besides the coexistence of hysterical deafness and muteness for two years, the case is remarkable for the duration of the muteness, fourteen years. The most prolonged cases of mutism cited by authors are those of Pitres, ten years, and Sébillot, twelve years.

It is curious to record the explanation which the physician of the 17th century gave for this cure.

"Cannot we attribute the reestablishment of hearing to the efforts made by Gilbert in digging? The movement which he made in working accelerated the blood and made it more fluid, and the auditory nerves were no longer obstructed. The peasant heard before he could speak because the obstruction of the auditory nerves was not so great as that of the nerves of the tongue. For this reason, the viscous matter which hindered the passages of impulses was dissolved sooner in one instance than in the other.

"That which contributed not a little to giving him speech was his joy in being with his companions, and the wine he drank added to his gaiety. His spirits became more active and more subtle. Again, perhaps he dreamed in his slumber that he was engaged in some violent act which set his impulses in action (for during sleep they are more abundant internally, since they are not dissipated by the external senses)."

Bartholin gives the history of an almost analogous case. This celebrated Danish physician relates that a citizen of Copenhagen had completely lost his voice, and could not

**Observations rares de medicine, d'anatomie et de chirurgie*, translated from the Latin of M. Vander-Weil, by M. Planque, M. D., liv. II, obs. V, 1698.

emit a sound. Four years after the commencement of the attack, he was crossing a wooden bridge in the city, when he met an old woman whom he had detested for a long time. Filled with anger and hate, he cried out abruptly: "The devil take you!" The sound of his voice gave him keen emotion and he was greatly mortified to have commenced to use his tongue with an imprecation.*

"It is probable," says Bartholin, "that a clot of blood or thick phlegm had lodged at the commencement of the lingual artery and had compressed the neighboring nerves, but that the emotion of anger agitated the blood which broke up and destroyed the obstacle."

This total aphonia, cured suddenly by a violent access of anger, can only belong to hysteria. It corresponds to the classic description of Charcot: "Although the patient has wholly retained the ordinary movements of the tongue and lips, which he can move readily in all directions for breathing or whistling, as in the normal, it is impossible for him to articulate a single word, even in a low voice, in other words to whisper, and, more than that, even with the greatest attention, to imitate the movements of articulation which he sees before him. The patient is mute then in the strict acceptance of the term, in the sense that he cannot utter a word. I will add that he is more than mute; for while it is possible for the deaf-mute to emit even loud cries, the hysterical mute—mark this singular feature—is usually absolutely aphonic, so that he cannot give forth the slightest cry."†

The *Ephemerides des curieux de la nature*, years IX and X, 1678, and 1679, relate a case of intermittent hysterical mutism, remarkable for its systematization and duration:

"Georges Algajer, aged 25, gradually lost the faculty of speech, consequent upon heart disease followed by vomiting. Extinction of his voice was at first only temporary; later it persisted, prolonging itself day by day to an hour, three hours, eight hours, twenty-three hours, without regularity. Finally, the return of speech came at a regular time, so that for fourteen years the patient could speak for one hour only, from noon until one o'clock.

*Th. Bartholin, *Act. Hafnia*, 1671, obs. 71.

†*Oeuvres complètes* of J. M. Charcot, published by Bourneville, t. III.

According to the author, it was impossible to deceive the man by changing the hands of the clock; even if this were done his attack of muteness came only at the proper time. During the time when he could use his voice, Algajer answered all questions and spoke upon all subjects with clearness and precision, and he even read in a low voice, but as soon as one o'clock arrived he could make himself understood only by signs."

This observation of intermittent muteness is analogous to the very classical one of Mendel, where the patient could speak every day from six to nine in the morning and remained mute for the rest of the day.*

L'Histoire de l'académie royal des Sciences contains a number of cases of the same sort. Here is an interesting case of 1700:

"A girl, aged twenty or twenty-two years, of good temperament, after an intermittent fever, which was stopped by the ordinary remedies, had a loss of voice which lasted without intermission for a year and a half. The customary remedies for this inconvenience gave no relief; except that when she was required to take a bath (demi-bain) she sometimes recovered her speech while in the water, but with some hoarseness. When she had this fever she was able to speak during the algid stage. M. Lemery, who had ordered several remedies for sequelæ of the fever, but not for the loss of voice, prescribed one, almost at hazard, which had an astonishing effect. This was of vulnerary herbs in the form of tea.

"As soon as she took this the first time, her voice returned for a half hour and was then again lost. But by continuing the use of the infusion, either warm or cold, she made her voice come back little by little, so that she lost it only of evenings, especially if she went out into the fresh air. Finally, even in this event, she was relieved by taking two spoonfuls of her infusion. She would hardly cease drinking when she could speak.

"It might be believed that the virtue of the infusion could only have been that of warm water, but she drank warm water several times without avail. Decoctions of herbs rich in acids, and even coffee, chocolate, salad, raw fruit, fish, thin soup, or too great an interval between

*Pitres, Lecons cliniques sur l'hystérie et l'hypnotisme, t. I.

meals, deprived her of speech. Meat, milk and wine did not have this effect. She always carried a bottle of her infusion to use as needed, and she said that she carried her voice in her pocket."*

This case of Lemery, the elder, later led his son to employ the same treatment in the following case. The result was equally excellent, and the thought is easily warranted that suggestion alone occasioned these two marvelous cures of mutism.

"A girl, aged twenty-four, after the age of seventeen was subject to loss of voice, which came on at the menstrual period and lasted two or three days, during which she used a diet-drink of couch grass and wild poppy. This moistened her chest, which she needed, but it did not restore her voice, which returned only after her menstrual period and appeared to come back of itself. A blow which broke her arm at the time of her menses, and keen chagrin at this time, stopped them and caused her to have stifling sensations and violent spells. She was cured by a great number of bleedings from the arm and foot, by emetics and various medicines, but the effect of these remedies was followed by lasting loss of voice. She could hardly make herself understood unless one brought his ear near her mouth; what little she spoke fatigued her so that she was obliged to stop. She felt a weight in the region of her stomach and she could not make the least movement without almost losing her breath. Her periods were now regular, but all her troubles were increased at these times. As for the rest she had a good appearance and appetite, and all other functions were normal.

"This condition lasted for three months in spite of every imaginable remedy. Finally, Lemery, following the example of a similar observation reported in 1700 by his father and cured by vulneraries taken in infusion, ordered it for this patient. As soon as she had taken a single cupful, her voice came back strong and vigorous as it was before her illness; there was no more oppression nor difficulty of moving, and a singular circumstance which accompanied the sudden cure was that the girl felt the

**Histoire de l'Academie royale des Sciences*, 1700.

weight which she had upon her stomach fall at that moment to her umbilicus, where it disappeared."**

With the 18th century we meet with more numerous accounts. Bonet notes that a shepherd found himself mute upon awakening from a deep sleep, and that fourteen days afterward, dreaming that he was drowning and calling for help, he awoke in his distress and used his natural voice to render thanks to God.† Is not this case similar to that of Bateman:

A patient, aphasic for six days, awoke in the morning crying: "A man in the river!" He had dreamed that a man had fallen into the river, and the mental shock produced by the dream was sufficient to give him speech.‡

In a letter addressed to the Academy of Sciences,|| the Count of Biévre vouched for his observation of the following instance:

"A female peasant in the country town Villantrois, in Berry, was accouched in the summer of 1737, but the afterbirth did not follow the child. Some days afterward, her voice failed her. Although she had not been properly delivered, her health returned and she went to work again in the household as usual, except that she kept profound silence. At the end of a month some incident occurred which suddenly made her so angry at her husband that she recovered her voice sufficiently to scold him, and, apparently, he was very repentant. From this time on she spoke as freely as before her accouchment, still carrying her afterbirth. This is very extraordinary and in more than one respect."

It appears quite probable that we have here a case of hysterical muteness occasioned by the accouchment. Although confinement is a physiologic matter, it is none the less sometimes provocative of a neurosis by reason of the great traumatism produced, as Macario has pointed out.§

I have no intention of citing here all the observations of hysterical muteness which the authors of the 18th century

**Histoire de l'Academie royale des Sciences*, 1719.

†*Medicin, septent. lib de Peet. affect.*

‡*Cartaz. Du mutisme hysterique (Progrès Médicale, 1886).*

||*Histoire de l'Academie royale des Sciences*, 1738.

§*Macario. Des paralyses dynamiques et nerveuses*, 1859.

have left us; most of them are reproduced in contemporaneous classic treatises. I will recall, however, the typical case of Watson's, cited by Briquet: "A young woman, after an attack of convulsive hysteria, lost her voice and was absolutely mute for fourteen months. During this time she had no new convulsive attacks, and enjoyed perfect health. One evening, after being considerably heated from four hours' dancing, she recovered her voice and continued to speak thereafter."*

The cases I have related abundantly show that hysterical mutism has been observed from the earliest times. It belonged to the 19th century to elucidate its nature and study its pathognomonic characters. Explanation is ample to-day in this respect. The fascination of marvels is, however, so great that our contemporaries of the 20th century still became ecstatic over the "miracle story" which filled the English journals in April, 1901.

"It relates to a French sailor, named Jean Mafurlin, who fourteen years ago, fell from a mast in Portsmouth harbor and remained under the water some ten minutes. When he was brought to the surface, half dead, the unfortunate man had completely lost the use of his voice. He was cared for, and a Barking gardner took him into his employ.

"It is to be noted that Mafurlin, at the time of his mishap, knew only a few words of English, but freely spoke French, Italian and Portuguese.

"When the unfortunate man had been in the gardener's service for fourteen years, during which time he was mute, he sustained a severe shock one day by the sudden discharge of a cannon near him. The shock almost instantly restored his voice, and Jean Mafurlin began to speak English, French, Italian and Portuguese. English is now even more familiar to him than the other languages, which he has partly forgotten."

This case, which amused the chroniclers of both worlds, is not difficult to explain. Jean Mafurlin had been attacked with hysterical muteness following a violent emotion; another violent emotion cured him. Such a thing need not surprise us. It is the nature of hysterical affec-

*Watson. *Philosoph. trans.*, vol. XIV.

tions to come on and to disappear with equal suddenness. "Hysterical attacks," says Pitres, "may be suddenly provoked, modified, or suppressed by psychic influences or physical causes, which have no effect upon similar attacks depending upon organic lesions. Hysteria is the great provider of unexpected and extraordinary cures. Even in cases which appear most obstinate, a lively moral emotion, fright, anger, vexation, chagrin or joy may quickly induce a cure."

In regard to the case of Jean Mafurlin, occurring in the twentieth century, it is no doubt unnecessary to recall that of Gilbert in the seventeenth century; they may be regarded as parallel. It is more interesting for the thinker to compare the interpretations of the same thing, set forth with an interval of more than two centuries between.

ABSTRACTS FROM CURRENT OTOLOGIC, RHINO- LOGIC AND LARYNGOLOGIC LITERATURE.

I.—EAR.

Otitic Brain Abscess.

PAUL MANASSE. (*Zeitschrift für Ohrenheilkunde*, Bd. 38.) The patient, aet. 33 years, suffered from otitis media acuta for five weeks. The operator intended to do a single Schwartz operation; however, upon elevating the periosteum he found a fistula with pus welling up into it, situated above and behind the auditory canal. The edge of the fistula was chiseled away and friable bone filled with pus and granulations removed. The fistula led directly to the dura which was covered with pus and discolored, and which showed an irregular opening one centimeter long running to a cavity within the temporal lobe. In this was found a yellowish-red mass of brain substance mixed with pus. Recovery was uneventful.

A second case was a man 24 years of age who suffered from middle ear suppuration for some years. For four days he had severe headaches and later weakness in the left arm and leg, the objective signs showing polypi and white cholesteatomatous masses in the auditory canal. The diagnosis made was cholesteatoma of the middle ear and abscess of the right temporal lobe. The antrum was filled with cholesteatomatous masses and pus. The typical radical operation was made and the tegmen antri and tympani was chiselled away. The dura was covered with granulations in one small place over the antrum and greenish-brown foul-smelling pus found. The abscess was about the size of a hen's egg, with numerous pockets. One of these pockets, during the after-treatment, became subjected to pus retention which manifested itself by headache and great weakness in the left arm. After relieving this by introducing the fingers, recovery was uneventful.

Levy.

Arrhythmic Pulsation in a Cicatrix of the Drum Membrane.

GROSSMANN (*Berliner Otol. Gesellsch.*, May 14, 1901.) exhibited a case in which there was struma on the same side and likewise valvular insufficiency. *Levy.*

Sequestrum of the Ear.

GROSSMANN (*Berliner Otol. Gesellsch.*, May 14, 1901) demonstrated a case caused by acute middle ear suppuration. He found necrosis six times in one hundred cases of acute suppuration. Discussion of this case showed that dizziness seldom occurs in children. *Levy.*

The Present Position of Otogenous Pyemia.

JANSEN (*Deutscher Otol. Gesellsch.*, May 24-25, 1900) states that the following are to be distinguished: 1, obstructive septic disintegrated thrombosis; 2, thrombosis along the wall; 3, compression thrombosis. The dura offers a much stronger resistance to the suppurative process than the thinner sinus wall. The thrombus along the vessel wall may be relieved if the external portion is removed. In a solid thrombus, cure may follow an early disappearance of the exciting cause. Compression thrombosis is no contraindication to operation. Bulbus-thrombosis is especially liable to occur in acute middle ear suppuration, and following this pyemia. We do not find the so-called osteophlebitic pyemia (Körner) resulting from the veins of the bones but in its place we find pyemic sinus-thrombosis. In infants alone is it possible for pyemia to result from the entrance of toxins. He observed metastases in joints and muscles in ten cases of sinus thrombosis which were all typical. It is generally admitted that the septic thrombus should be removed. Mild cases of pyemia may be cured by laying the sinus free. Opening the sinus and ligature of the jugular, according to the literature of the subject, gives better results than where the former alone is done. According to Jansen, the operation is indicated in all cases of sepsis or severe pyemia with serious general symptoms and pulmonary metastases, otherwise only when the infected fluid of the sinus extends to the bulbus. In thrombosis along the wall, the general symptoms are well defined.

Brieger stated that otogenous pyemia has no simple genesis. There are cases in which normal anatomic re-

lations are found in all the venous plexus of the ear. There are also pure bacterial emboli.

Streptococci are the usual cause of the suppuration. The diagnosis of otogenous pyemia can only be established by the characteristic temperature curve; however, there are cases in which the fever is either atypical or absent. Cure has even followed marked meningitis, metastatic lung abscesses and severe poisoning. In the discussion, Körner agreed that osteopylebitic pyemia was less common than formerly supposed, but the possibility of its occurrence must be established by future observation.

Jansen remarks in conclusion that an absolutely lethal prognosis need not be given when lumbar puncture gives a positive result.

Levy.

Nasal Obstruction and Ear Disease.

A. C. BARDES, New York. (*Medical Record*, Nov. 16, 1901.) A review of the nasal conditions, both of development and of disease, which tend to cause disease of the ear, such as adenoids, large tonsils, nasal catarrh and nasal obstruction. The relation of the exanthemata and other infectious diseases to diseases of the ear and the treatment is considered. One of the first things to be done in connection with any ear trouble is to get the nose and throat into a healthy state. Internal medication is often desirable as an adjunct to local treatment.

Richards.

A Case of Bilateral Labyrinth Necrosis with Bilateral Facial and Auditory Paralysis.

HERZFIELD. (*Berliner Klin. Woch.*, 1901, No. 35.) A boy of nine and a half years of age, had pain in both ears and swelling of the mastoid, three days after the appearance of an attack of scarlet fever and pharyngitis. At the same time or a day later, he was affected with bilateral facial paralysis and deafness. There was no vertigo or vomiting. Operation was performed on the left side six weeks later. The entire mastoid was necrosed and the horizontal semi-circular canal abraded. The limits of the necrosis of the labyrinth were not marked off at the time. Fourteen days later a sequestrum which included the larger portion of the semi-circular canals was removed. In the right ear there were sequestrum of the mastoid and caries of the Fallopian canal and horizontal semi-circular

canal. Recovery uneventful. Paralysis of the facial and auditory nerves unchanged. The eye conditions are worthy of note. Voluntary or reflex closure of lids impossible, but both eyes are closed in sleep. By way of explanation the writer presents two points: (1) in sleep there is a cessation of the tone of the smooth muscular fibres, supplied by the sympathetic, which lie in both lids, and which cause the widening of the palpebral fissure; (2) the bulb is drawn back into the orbit by the four recti. When the patient is awake, they act through the agency of the same smooth muscular fibres of Tenon's capsule which are innervated by the sympathetic. On this account they act properly in sleep. *Levy.*

Bilateral Malformation of the Hearing Apparatus.

KAUFMANN, (*Zeitschr. für Ohren.*, Bd. 39) had the opportunity of investigating anatomically four malformations in two individuals. They exhibited the same sort of arrest of development in different grades. Only one auricle was substantially normal, the three others being atrophied and appearing as superficial cutaneous flaps, containing cartilage particles. The auditory canal was represented by a small groove in the bone, the middle ear being enclosed by solid bone. Hammer and anvil in two preparations were the subject of bony union, and were adherent to the lateral wall of the atticus. The stapes, smaller than normal, was imbedded in a pseudo-membrane, which stretched across the entire tympanic cavity. Antrum was absent and the tube normal. Labyrinth normal in all preparations. *Levy.*

The Advisability of Early Operative Intervention in Acute Mastoiditis.

EDWARD BRADFORD DENCH. (*New York Med. Journal*, Oct. 19, 1901.) Dench gives the report of a case of acute suppurative middle-ear inflammation, with the mastoid tenderness and other indistinct symptoms referable to the mastoid. The acute process subsided, and some few months later a swelling appeared over the mastoid process. This swelling was incised, a profuse flow of pus following. Upon probing it was ascertained that cortical perforation of the mastoid bone had taken place. The mastoid cells were completely filled with a mass of granulated tissue. The trabeculae between the cells were carious, and the

entire mastoid process was converted into one large cell.

The writer assumes the radical stand that in cases of mastoid inflammation sufficiently severe to cause pronounced tenderness, with a fluctuating post-aural swelling, expectancy must not be employed, but operative intervention is invariably indicated. The editor is in thorough accord with the views of the writer, as the opening of the mastoid under aseptic precautions is absolutely devoid of danger, and the delay in a doubtful case is apt to lead to serious and dangerous complications.

Seymour Oppenheimer.

The Mastoid Operation in the Constitutional Diseases.

BARTH (*Zeitschrift für Ohrenheilk.*, Bd. 38) gives a very valuable exposition upon the question whether or not serious surgical operations should be undertaken in diabetics. His case was one of acute otitis media in a 64 year old man, who had suffered from diabetes (sugar 4 per cent.) for a year. Under appropriate diet, the sugar had been reduced to 2 per cent. After five weeks the writer decided that as the pain behind the ear continued and the secretion remained unusually copious, a mastoid operation should be performed. By reason of the fact that another aurist advised delay, the operation was postponed. In the course of the next week, a decided change for the worse took place and a sequestrum was discovered upon the posterior wall. Pain increased and considerable swelling upon and under the mastoid appeared. Upon operation the cortex was found friable and discolored, the posterior superior wall being entirely sequestered. The cure was not influenced by the increased pain. It is also interesting to note that by this time the antidiabetic diet had caused a disappearance of the sugar. In another case there was an acute otitis media in an old man requiring an operation after a few days. Chilly sensations and severe headaches appeared two days after, indicating upon examination a typical attack of gout, the wound itself and its vicinity being reddened and inflamed. The changes disappeared with discontinuance of the gouty attack which was localized in the great toe, wherefrom the writer believes that the infiltration in the vicinity of the wound was likewise gouty.

In the third case, a patient with pulmonary tuberculosis became affected with tuberculosis of the ear and temporal

bone. The disease in the ear appeared as an acute otitis media, entirely painless. The continuance of the fever indicated operation. Tubercle bacilli in the antrum pus. During the after treatment it became necessary to close up two fistulae. Hearing regained in four weeks, after incision of a peritonsillar abscess. When the patient recovered he could hear whispered voice at five meters. In five months, under appropriate treatment, the lung affection was cured.

Levy.

**The Clinical and Pathologico-Anatomic Relations of the Ear
in True Diphtheria.**

LEON LEROIN (*Archiv. für Ohrenheilk.*, Bd. 52) believes that he is the first to undertake the extensive study of diphtheria in connection with the ear from the anatomic, clinical and bacteriologic standpoint. In all, there were sixty cases, bacteriologically examined; in fifty there were pathologic changes in the ear, in thirty-eight of which they were caused by the predominant disease. He distinguishes three groups, those with evident symptoms of otitis media, those with slight changes and those with tubal and tympanic catarrh.

The symptom-complex shows itself in the signs of a serous exudate, retraction, dimness and diffuse redness of the drum membrane. These remain constant from the beginning of the attack and throughout its whole course. Subjective symptoms are generally not present. Paracentesis was performed but once; spontaneous rupture did not occur in any instance. Hearing was generally moderately diminished. The ear affection, in the main, was present in the early cases, occurring, perhaps, coincident or previous to the pharyngeal symptoms. Small children were especially affected. It was impossible to demonstrate any relation between the frequency and intensity of the ear symptoms and the intensity and extensiveness of the pharyngeal symptoms; however, it was possible to do so in regard to the severity of the general and ear manifestations. In one case, diphtheria of the auricle and the external ear was demonstrated bacteriologically, in which the pharynx had been free from the beginning. The writer believes this case to have been one of primary diphtheria of the middle ear. Diphtheria of the posterior surface of the auricle was found in several cases. In the majority of the cases the

slow course of the otitis media was striking, and even in the later stages was not accompanied by graver symptoms.

Specific diphtheritic otitis media occurred very seldom, being associated with severe general symptoms. The anatomic observation included twenty temporal bones. The middle ear was found entirely normal, one time; free from secretion twice; filled with serous exudate seven times; pure tenacious pus eleven times. The changes in the mucous membrane of the latter cases was of a much higher grade; in three, partial necrosis was present, in one case sequestrum in the antrum. The changes in the tube were most marked near the pharynx. Diphtheria bacilli were in no case found.

The Symptomatology of Hysterical Hypesthesia Acustica.

HAMMERSCHLAG. (*Monatschr. f. Ohrenheil.* Bd. XXXV) states that complete hysterical deafness occurs less frequently than reduction in hearing. In addition, it is to be observed that in complete deafness of one side, the hearing is diminished on the other. In these cases retention of sensibility and faradic excitability are proportionate. The characteristic hysterical deafness presents a striking incongruity in the diminished hearing acuity for speech and tuning fork on one side, and tuning fork and watch on the other, both by air and bone conduction. Bone perception for the tuning fork is greatly diminished while the watch is heard, through bone conduction, although it is a source of weaker sounds. Occasionally a considerable shortening of the tuning-fork perception through air conduction is observed, although whispering may still be heard at 6 meters. The writer considers that these symptoms show a slight abnormal fatigue of the auditory nerves for continuous sound excitation diminishing in intensity. This may be demonstrated in the following way: A tuning fork of medium pitch is held before the ear until the patient states that he does not hear it any longer. It is then taken away, and after two seconds it is held again near the ear; the patient now hears it again. This observation may be repeated a third time. The correctness of the diagnosis is shown by a series of cases which were subjected to suggestion-therapy.

Levy.

Blue Coloration of the Drum Membrane, and the Occurrence of Varices Upon the Drum Membrane.

T. ROHRER (*Zeitschrift für Ohrenheilk.*, Bd. 39.) There are drum membranes which are light blue, blueish-gray or greenish blue in color, or in which the color is confined to certain portions. A blue or violet color is often found over the tendon, resulting from a considerable deepening of the floor of the tympanic cavity, or from a deep position of the whole annulus and a projection of the bony canal. Similar spots are sometimes found in the neighborhood of the ostium tympanicum.

A blue color is sometimes seen in the lower part or over the whole of the drum membrane when a dark or blood-colored exudate is present. Of special importance is the blue color of the tympanic cavity, seen when the bulbus jugularis lies high, and dehiscence of the bony wall is present. Several cases of serious hemorrhage after paracentesis exhibited upon later examination a blue shadow at the bottom of the tympanic cavity, demonstrating that the blood came from the jugular.

The writer details an exceptionally uncommon case of blue coloration of the drum. A seven-year-old boy came under his observation for an obscure affection. The entire left drum was of a diffuse dark blue color. In the posterior superior quadrant on the right side, there was a prominent bluish-red tumor, of the size of a grain of pepper, which was recognized as a varix. In the course of seven years of observation numerous changes took place in both drum membranes. The diffuse blue color disappeared and then returned, the varix shriveled up, a cicatrix appearing in its place, then new varices large in size appeared. Hearing on both sides was five meters for whisper.

Levy.

Otitic Diseases of the Brain, Meninges, and of the Blood Vessels.

WITTE AND STURM. (*Zeitschrift für Ohrenheilk.*, Bd. 38,) report twelve cases of intracranial affection treated by operation, which should be read in the original. *Levy.*

Therapeutic Value of Vibration-Massage of the Drum.

SCHWABACH (*Zeitschrift für Ohrenheilk.*, Bd. 39,) has used Breitung's apparatus in 173 cases, 70 with unilateral and 103 with bilateral affections of the ear, a total of 276

ears. It was used daily, at first with slight rapidity, viz: 600 vibrations with a stroke of 2 mm. If no vertigo or other symptoms resulted, the rapidity was gradually increased up to 1,200 vibrations, while the stroke never exceeded 5 mm. Under these conditions the writer did not observe any unpleasant symptoms, as fainting, severe pain, vomiting. If vertigo occurred often, treatment was discontinued. He does not consider it necessary to completely close the auditory canal by a rubber ring. Great sensitiveness was not observed. The sittings lasted from one to two minutes and treatment was discontinued if no improvement was noted after one week. Treatment was only continued in such cases which showed substantial improvement. The results which are discussed are those in cases treated for two months to two years. At first he used the apparatus in middle-ear sclerosis, that is that form in which deafness and tinnitus with few objective symptoms were present, and in which an increased duration of perception of deeper tone by bone conduction and negative Rinne existed; 43 cases with 81 affected ears. Improvement of hearing resulted in only 4 cases; improvement in subjective noises, 19 out of 68. In simple chronic middle-ear catarrh, especially in the hypertrophic form, favorable results followed; 18 out of 46 with lasting improvement of hearing, and 16 out of 35 with improved subjective noises. In two cases in which massage alone caused slight improvement, the treatment was combined with Eustachian dilatation. Decided improvement occurred in one of these. Most of the cases had already been treated by the usual methods without result; 16 out of 27 cases of subacute middle-ear catarrh were improved. Still more successful were the cases which resulted from acute otitis media, from influenza, frequently causing in the course of the inflammation intense subjective noises. Out of 12 cases, in 6 was the hearing relatively improved, likewise the subjective noises in 6. The results were especially good in cases where there was a residuum of chronic middle-ear suppuration—22 out of 24 cured of subjective noises, and hearing was improved in 22. The writer considered from these results that vibration and massage is worthy of note as a remedy for the treatment of certain forms of middle-ear disease in which it has hitherto not been used. In middle-ear sclerosis it is of but slight benefit. *Levy.*

A Symptom of Hemoglobinuria; Cyanosis and Gangrene of the External Ear.

ROHRER saw a patient whose auricles were blue for six weeks after severe bodily exertion and exposure. The ears looked as if they were frozen. The urine contained albumin and hemoglobin. The hemoglobinuria was relieved; on the border of left helix a superficial gangrene appeared. Both affections were relieved in three months.

Levy.

The After Treatment of the Radical Mastoid Operation Without Tamponade.

A. V. ZUR MUHLEN (*Zeitschrift für Ohrenheilk.*, Bd. 39) has for some years modified the after treatment of these cases by leaving off the tampon after the first or second dressing. From his experience, he believes that the plan may be recommended in general, in the first place because of the painfulness of the tampon procedure, and secondly because the after treatment is shortened. At the operation, he takes away only so much of the healthy bone as is necessary to bring the disease completely into view. In all cases he sews up the wound primarily. The first dressing is left six days, the second, three. Then the tampon is left out and he removes the discharge by regularly syringing the ear. In fetid cases he adds a ten per cent. naphtholin solution. Granulation under this method is livelier than usual. Still, smooth epidermization usually occurs. It is seldom necessary to use a sharp spoon. The opening which remains is generally smaller than is usual. When there is an inclination to the formation of membrane between single sections of the cavity, the tampon of course must be used. Luxuriant granulations are only found when diseased bone is present.

Levy.

Pathologic Anatomy of the Inner Ear and Auditory Nerves.

PAUL MANASSE (*Zeitschrift für Ohrenheil.*, Bd. 39) discusses the pathologic anatomy of the inner ear in two cases without previous clinical examination. The first, was a man, aet. 43, who died of pulmonary tuberculosis. External and middle ear and labyrinth were normal. The auditory nerves, however, upon being treated with the usual stains, showed a large number of light spots enclosed between the longitudinal fibres, some round, some long. Under high power, it was found that they were composed of

a fine network with amylaceous bodies contained within them. There was no connection with the nervous substance. The writer considers the affection as a grey degeneration, such as is usually found in multiple sclerosis, tabes, etc. It is remarkable, however, that other signs of degeneration are absent from the nervous system.

The other case was a syphilitic, aged 35 years, who died suddenly, after being deaf for many years. On autopsy, extensive specific changes of the cerebral arteries were found, also an aneurysm of the basilar artery of the size of a pea, rupture of which caused death; gummatæ in both testicles. Nothing abnormal was found in the middle ear. Small granular projections were found upon the epithelium of the vestibular and tympanic part of the cochlea, which appeared as small amorphous granules. In the cochlea were observed between the epithelium and periosteum a fine, fairly extensive meshwork of connective tissue, through which scanty star-shaped connective tissue cells were scattered. Similar changes were found in the vestibule, especially in the perilymphatic spaces. At the point of entrance of the auditory nerve into the labyrinth, the nerve fibres were separated on account of collection of blood and round cells, and further toward the center there were numerous round cell infiltrations. Essentially the same changes were found on the right side, the meshwork being particularly marked. The writer considers the affection a periostitis interna of the labyrinth, probably of syphilitic origin. Lymphoma of the auditory nerves have previously been found in other cases of syphilis of the ear.

Levy.

Symptoms Pointing to the Necessity for Operative Interference in Mastoid Suppuration.

WENDELL C. PHILLIPS, New York. (*American Journal of the Med. Sciences*, Dec., 1901.) In acute suppurative middle-ear trouble, microscopic examination of the pus should be made. This pus is more virulent when the streptococci are in excess. The most marked symptom of acute mastoid inflammation is pain, coming on after the severe pain of the middle ear has passed away, and after discharge has been established. The pain is a dull, heavy one, not localized, but diffused over the surface of the temporal bone, and located most sharply behind and above

the middle ear. This pain may or may not be constant, and will have some relation to the amount of discharge. There is usually marked pain on pressure, at the tip of the mastoid, but it is more significant when present over the mastoid antrum. The expression is not one of agonizing pain, but rather an unhappy one. The temperature may or may not be high. External periostitis may be considered as a symptom, although, as a rule, operative interference should be resorted to before this symptom appears. Bulging of the posterior superior portion of the wall of the canal, with tenderness upon pressure over the region of the antrum, is a prominent symptom.

Very early symptoms may be relieved by measures other than external operation. Free incision of the drum; local blood-letting; leeches; the Leiter coil; poultices; hot douching, once or twice an hour—are all abortive remedies that will sometimes avail. They should not, however, be used for a long time, as both the ice-coil and the hot poultice tend to do harm by masking the symptoms, if continued too long. The patient should be kept in bed. The exact time for operation must be determined by the good judgment of the operator.

Early operation seems to give better results for the hearing, and to render less liable the involvement of the brain or lateral sinus. The operation should not be done simply because it will do no harm, but only when positive indications for it are present, and then without unnecessary delay. The author does not believe in the Wilde incision, thinking that local blood-letting can be obtained by much simpler methods.

Tuberculous Otitis Media, Mastoiditis and Meningitis in an Otherwise Apparently Healthy Adult—Brief Report of a Case.

JAMES FRANCIS McCAW, Watertown, New York. (*Medical News*, Oct. 12, 1901.) The case was one of intracranial involvement following a chronic otorrhea, with cerebral abscess as a probable diagnosis. Patient was 45 years old, of good health, with occasional attacks of pain in and around the ear, and some discharge, which was followed by relief of symptoms. The present attack had lasted seven weeks, patient gradually growing worse, becoming

drowsy, and was in a deep stupor twelve hours before the operation.

On opening the mastoid the destruction of bone was found to be widespread, the entire space being filled with granulation tissue, the destruction extending upward and forward between the tables of the occipital bone, inwardly destroying the wall of the sigmoid sinus and inner table of the skull. On removing the granulation tissue and carious bone, the wall of the sigmoid sinus and meninges were found very much thickened, and everywhere studded with small typical miliary tubercles. There were several caseating patches on the wall of the sinus, which was, however, pervious. Patient died twelve hours later. At the post mortem the lungs, liver, spleen and kidneys were found free of tuberculous infection and the mesenteric glands were not enlarged.

The case was one of tuberculous otitis media, mastoiditis and meningitis, and was not an operable case.

Author thinks the tuberculosis was primary in the middle ear and mastoid, and his researches seem to show that primary tuberculosis of the middle ear is of comparatively rare occurrence.

Aniline Oil, with the Report of a Case Showing Toxic Symptoms from Its Use in the Ear.

HOMER DUPUY (*The Laryngoscope*, Oct., 1901) discusses a case in which a combination of cocaine with aniline oil had been employed for the relief of earache.

Profound intoxication ensued. The lips and nails were of a bluish black color; face ashy in hue, skin cold and clammy. An intense sweat bathed the entire surface of the body. Pupils were apparently normal, pulse 136 and compressible, respiration 36, sighing in character. Temperature, by axilla, 97.3° F.

This bluish discoloration of the lips and finger tips remained for several days but then subsided, the patient remaining much prostrated. (We cannot with impunity place so toxic and so readily absorbed an agent as aniline in the hands of patients for purposes of frequent instillation.)

Seymour Oppenheimer.

II.—NOSE AND NASO-PHARYNX.

Can Nasal Catarrh and Catarrhal Deafness be Cured?

CAROLUS M. COBB, Boston, Mass. (*Medical Record*, Sept. 7, 1901.) The author regards most cases of nasal catarrh and catarrhal deafness as due to some interference with the drainage from the nasal accessory sinuses, and these diseases should be treated by improving the drainage of the cavity from which the discharge follows. He does not think that postnasal catarrh is caused by mouth breathing, and says that operations upon the nose to relieve nasal obstruction are only useful to relieve the condition of the oropharynx and larynx and pharyngeal mucous membrane, but that they do not relieve post nasal catarrh except as they incidentally or accidentally improve the drainage from the accessory cavities. He thinks that sinus disease is much more common than was formerly recognized to be the case, and believes that the fact that over 90 per cent. of cases of disease of the nasal accessory cavities is unrecognized during life explains the failure to cure postnasal catarrh and catarrhal deafness. A number of cases are cited in which relief followed measures, such as the removal of the middle turbinate, which improved the drainage from the accessory cavities. *Richards.*

A Case of Epileptiform Convulsions Caused by a Shoe Button in the Nose.

J. S. STEELE (*The Laryngoscope*, Oct., 1901) reports a case of a child six years of age suffering from a muco-purulent discharge from the nose which was found to be due to a shoe button, which was lodged high up in the nose for a considerable period of time. Coincidental with the catarrhal process, the child manifested frequent epileptiform convulsions which, after the removal of the foreign body and the correction of the turbinal hypertrophies, have entirely disappeared. *Seymour Oppenheimer.*

Four Cases of Tumors of the Nose.

J. E. NEWCOMB (*N. Y. Medical News*, Oct. 1901) reports four extremely interesting and comparatively rare cases; namely, osteo-sarcoma of the inferior turbinate, true papilloma of the nasal septum, sarcoma of the branchial cleft and angeio-fibroma of the nose.

Seymour Oppenheimer.

The Nasal Septum.

W. J. FREEMAN. (*The Laryngoscope*, Oct., 1901.) In a very extensive and comprehensive paper, Freeman describes the embryonic and anatomic development of the nasal septum.

The pathologic conditions are considered according to the following practical classification:

1. Deformity. (a, deviation; b, dislocation; c, ridges and spurs.)
2. Hypertrophy. (a, of the tubercles; b, of the septal folds; c, of the mucous membrane in general.)
3. Atrophy, leading to deformity of the external nose.
4. Hematoma, followed by a, abscess, which may lead to b, perforation.
5. Ulceration, leading to a, perforation, and often to b, synechia.
6. Vascular dilatation.
7. Synechia.
8. Lupus, tuberculosis and syphilis.
9. Tumors.
10. Anomalies.

In discussing the etiology of septal deformity, the author says that excepting in the instances where deformities of the septum are due to traumatism or disease, we must look upon them for the most part as the results of evolutionary, or, perhaps, more properly speaking, of devolutionary changes. The external nose of certain peoples, the African negro, Egyptian, American Indian, and others, is more or less characteristic, and it is the result of centuries of exclusiveness, which thus preserved the purity of the races. The high or leptorrhinie nose of the dolichocephalic head needs a greater development of the septum than the low nose in the brachycephalic type; consequently in the intermarriage of different races, should the nose tend to follow the leptorrhinie character, say, of the father, while the rest of the facial bones follow the platyrhинic type of the mother, there must necessarily be a bending of the septum, locked, as it is, in a frame already ossified. Broca, who has given special attention to the ethnologic study of the nose, finds that when one race has conquered another, the nose, as generations go by, begins to follow the type of that of the more numerous race. It is curious

to note that the prominent nose of the Roman was almost always deviated, while that of the American Indian is almost always straight. May we not, however, argue that the Roman nation was a fast degenerating race, and that there was already a great admixture of foreign elements? In this country, and, in fact, in all civilized lands, the mingling of the races is very great, and this is undoubtedly one of the principal causes for the prevalence of septal deformities.

Seymour Oppenheimer.

The Technique of Intra-Nasal Operations.

A. DENKER, (*Zeitsch. für Ohrenheil.*, Bd. 39), recommends the galvanocautery to prevent hemorrhage. In the removal of hypertrophies of the inferior and middle turbinate, the blood vessels should be cut through with the galvano-cautery. In resection of the cartilaginous and bony septal projections, he passes the cautery where possible over their base and above and below the mucosa as far as the bone or cartilage.

Levy.

The Relation of the Middle Turbinate Body to Chronic Diseases.

CHARLES H. BAKER, Bay City, Mich. (*Philadelphia Medical Journal*, Dec. 28, 1901.) After reviewing the anatomy of the middle turbinate, the various affections are considered in connection with which its removal seems advisable. The middle turbinate ought to be removed whenever it interferes with free drainage from the accessory cavities; in connection with polypi formation concealed above and behind it; whenever there is fetid crusting in the upper portion of the nasal chambers in non-specific cases; whenever it is markedly hypertrophied, pressing hard against the septum; in cases of bullous hypertrophy; in many atrophic cases in which it appears to be the focus of infection; in cases of reflex sneezing, coughing, asthma, various eye reflexes, vertigo, tinnitus, chorea, epilepsy. In these latter cases the middle turbinate should be carefully examined and if in any way apparently causative it ought to be removed. In periodic vasomotor rhinitis, with pressure, sneezing, reflex cough, conjunctivitis, the removal of the middle turbinate may not entirely cure, but will greatly mitigate the severity of the symptoms.

Richards.

Foreign Bodies in the Nose and Ear.

PERCY FRIDENBERG, New York. (*Medical Record*, Sept. 21, 1901.) This is a resume of the subject, with full details as to the best methods of removal. *Richards.*

On the Use of A. C. E. Mixture and Ethyl Bromid in Operations for Adenoid Vegetations.

J. W. GLEITSMANN, New York. (*Medical Record*, Nov. 2, 1901.) The author formerly used the A. C. E. mixture entirely, and usually operated at the patient's home. Now he uses ethyl bromid and operates in his office with trained assistants. He has never had any unpleasant experiences with this agent. The clothing must be perfectly loose, and a tight fitting mask is used. The ethyl bromid is administered in an upright position and operation done in this position. Merck's one-ounce glass tubes are used, and generally less than 30 gms. is sufficient to allow time for the removal of both tonsils and adenoids, and the recovery from anesthesia is rapid. No indrawing of blood into the trachea, cough or subsequent pulmonary symptoms have been observed.

Richards.

Therapy of Chronic Empyema of the Maxillary Sinus Including Methods of Operation.

ALSEN. (*Archiv für Laryngologie*, Bd. XII). The treatment of maxillary sinus suppuration always tries the patience of both physician and patient. The treatment often continues unbroken for years without cure. The writer believes that there is a constant renewal of the infection of the cavity if the opening in the canine fossa must be kept open; and if it is closed by a hard rubber plug it is impossible to guarantee an aseptic closure. The writer, working in Gerber's Clinic in Königsberg, established a wide communication with the middle meatus of the nose and closed the oral wound after removing the diseased portions of the mucosa in those cases requiring opening in the canine fossa. The after-treatment was carried on through the nose. The sutured portion heals generally in a week. The after-treatment in all the eleven cases was carried on without difficulty. In one case only, in which there was considerable caries, was it necessary to remove the sutures and carry out the treatment in the usual way. The method does not seem to be suited for such cases. In all the other cases, complete cure, or at least

cessation of symptoms followed. The communication with the nasal cavity remains.

Levy.

The Genesis of Hyperplasia of the Pharyngeal Tonsil.

BRIEGER. (*Archiv für Laryngologie*, Bd. XII). We are not in a position to establish a sharp line between normal and pathologic pharyngeal tonsils which are enlarged and therefore to be removed. The symptoms are not always in relation to the size of the growth. From the standpoint of etiology, heredity plays an important role which is, however, not to be overrated. Constitutional anomalies are rather of importance. Scrofula is certainly of importance, still, as is well known, the picture of the scrofulous habitus may be occasion by adenoid vegetations; and when they are removed it may disappear. Hereditary syphilis causes tumors which may deceive us as to the clinical picture, but which will show a difference when submitted to anatomic examination. The same is true of leukemia. Typhoid fever may stimulate the growth of the pharyngeal tonsil. The writer believes that the influence of the constitutional factor is not demonstrated, but that on the other hand, hyperplasia of the pharyngeal tonsil is a local manifestation of the hyperplastic process in the entire lymphatic apparatus. The influence of cleft of palate is not so important as heretofore held. The assumption that the swelling is of an inflammatory character has no support in the anatomic findings. On the contrary, the structure of the enlarged tonsil corresponds to the normal. It is a simple hyperplasia. The writer, therefore, comes to the conclusion that the special function of the pharyngeal tonsil in connection with the emigration of the white blood cells is established, that it is a protective organ and that it has the function of eliminating poisonous matters. The hypertrophy is to be considered in a teleological sense as the measure of the protection of the organism. The increased disposition to infectious diseases in children depends upon the fact that it is largest in that period of life. *Levy.*

Recurrence of Hyperplasia of the Pharyngeal Tonsil.

MAX GORKE. (*Archiv. für Laryng.*, Bd. XII.) Recurrences are found even when the operation is complete. It is not necessary for us to think of malignant tumor, even if sarcomatous tumors do occur hiding from view the

pharyngeal tonsil. Tuberculosis plays just as slight a role in the recurrences. The writer tried to arrive at a solution of the question through the medium of anatomic investigations. Generally, in complete removal, the basilar fibrocartilage is laid bare. However, small portions of the adenoid tissue remain in the recesses. By reason of the regenerative power of the lymphatic tissue, the new tumor arises from these, agreeing with the original tumor in structure, except that the layers are not so sharply separated as usual, and the connective tissue elements occupy more space. The lymphocytes come in all likelihood from emigration from the blood vessels, or perhaps, also from the lymphatics in the newly constructed tonsil. This regeneration occurs in all cases. To what extent this occurs, depends upon whether the cause which induced the primary hyperplasia still operates, or an increased function is required.

Levy.

III.—MOUTH AND PHARYNX.

Are the Tonsils to be Regarded as Normal Physiologic Organs of the Body.

FRANCKE H. BOSWORTH, New York (*Medical Record*, Jan. 11, 1902), reiterates the assertion made by him twenty years ago, that practically there are no tonsils in a healthy throat, and states that he is of the same opinion still, regarding the tonsil as a morbid growth or tumor which should be removed. He thinks that we have some justice for advocating the view that the almond-shaped organ in the fauces, which the old anatomists called the tonsil, has not justified its claim to be considered one of the normal organs of the body, either on anatomic, physiologic, or clinical grounds. He goes still further, and thinks that it constitutes a distinct menace to the health and welfare of the body in the filthy lacunæ which make up its main bulk.

For removal he uses general anesthesia in young children, giving preference to chloroform, and instead of the tonsillotome uses the cold wire snare, regarding this much more effectual in the thorough removal of the growth than the tonsillitome, and avoiding the danger from hemor-

rhage. The extirpation should be thorough, since a partial extirpation of the tonsil occasionally leaves the throat in as bad if not in a worse condition than before operation.

Richards.

The Function of the Tonsils, with a Few Suggestions Regarding the Differential Diagnosis of Tonsillar Affections.

R. C. MATHENY, Galesburg, Ill. (*Medical Record*, Sept. 14, 1901.) The author regards the common idea, that the limit of normal tonsillar tissue is on a level with the pillars of the fauces, as erroneous and does not consider the tonsil as an organ devoid of value, nor the circle of lymphoid tissue in the pharynx as being there by accident. Lymphoid tissue is the rendezvous of the leucocyte, concerning the action of which we as yet know but little. It must be of value to the economy, otherwise why are these structures always normally present to a greater or less extent.

The four faacial, lingual and pharyngeal tonsils have been put in the gateway leading to the stomach for some purpose, and he thinks that in childhood these lymphoid masses and nodules are a great preventive of many infectious processes. He does not consider that because the tonsils are subject to many inflammatory attacks they are therefore useless and ought to be removed. On passing from childhood to adult life the tonsils usually show a gradual retrograde process, since their need as protective agents seems to be less than in childhood.

The main questions concerning the tonsils should be: Are they dangerously pathologic? Have they degenerated to such an extent that they have lost their function and become inimical to health? They should not be excised simply because they project beyond the faacial pillars, nor does the child who has had one or two attacks of tonsillitis and who has prominent tonsils, necessarily need to have them excised. He regards much that has been said regarding follicular tonsillitis as the cause of secondary infections, to be erroneous.

Tonsils should be excised for the following conditions: Simple hypertrophy, when it is so great as to prevent the entrance of sufficient air in breathing; hypertrophy when accompanied by recurring attacks of tonsillitis; chronic degeneration; when the crypts are filled with caseous mat-

ter and accompanied by foul breath; in lupus, tuberculosis and malignant growths; when there is interference with proper voice production.

Richards.

Disagreeable Odor From the Mouth, Cause and Treatment.

RITTER. *Fetor ex ore* is a very common and vexatious disorder, the most frequent cause of which lies in the teeth. Attention should be given to caries, alveolar pyorrhea, tar-tar formation, fungus epulis, bad roots and carious teeth. Prosthetic appliances and obturators should be kept clean. Simple gingivitis may cause a bad odor. *Fetor* may re-main some time after the removal of a tooth from septic wounds. In these cases applications of carbolic acid solu-tions (one per cent.) or peroxid of hydrogen are of ser-vice. The odor is often caused by diseases of the nose and throat. Likewise, particles of secretion and saliva which lie in the crypts of the palatal tonsils, tonsils plug, ozena, empyema of the accessory cavities, chronic stomach dis-eases, carcinoma, bronchitis, bronchiectasis and cavities. Sometimes it is found in apical catarrh with slight secre-tion. The following is a refreshing mouth wash:

R	Tinc. Colom	-	-	-	10.
	Tinc. Myrrh	-	-	-	8.
	Olei. Menth. Pip.	-		9u viij.	
	Spir. Vini. rect.	-	-	-	90.
	Aquae. Dest.	-	-	-	90.

M. Sig. Half teaspoonful in a glass of water.

Particularly disagreeable is the *fetor* in tuberculosis and diabetes where fermentation of the stomach contents takes place some time after meals. Then menthol is of service, or validol, a combination of menthol and valerianic acid. In less frequent cases *fetor* is observed in bladder affec-tions. The odor following mercury and iodin administra-tion is characteristic. Prophylaxis is important. *Levy.*

The Occurrence and Treatment of Phlegmon of the Pharynx.

L GRUNWALD. The so-called peritonsillar abscesses are to be differently considered from etiologic, anatomic and therapeutic standpoints. Ordinarily it is a supratonsillar phlegmon which originates in the fossa supratonsillaris and which should be opened with a probe in this position (Killian). The symptoms are triasmus, swelling and red-ness of one side of the palate, edema of the soft palate and uvula, absence of tonsillar swelling. The uncommon,

true peritonsillar abscess, results from disease of the teeth or from foreign bodies, and progresses since the tonsil lies external and anterior to the surrounding connective tissue and is marked by edema and swelling of the palatine arch. Erysipelatous pharyngitis has a similar course. Tonsillar abscess proper is also uncommon. Swelling is considerable, but trismus is lacking. Pus will be found in these cases if a curved probe is introduced downward from the fossa supratonsillaris; also into the tonsil. Chronic tonsillar abscess may result. Acute retronasal phlegmon may clinically occasion a similar picture. High fever, severe prostration, dysphagia with typical typhoid symptoms may show themselves until the pus is emptied into the nose. If toxic symptoms occur, then the picture of Senator's acute infectious phlegmon appears. *Levy.*

Retropharyngeal Abscess From Otitis Media Suppurativa.

G. KIEN. (*Zeitsch. für Ohrenheilk.*, Bd. 39.) Burrowing abscesses of the throat from otitis media are fairly common, but retropharyngeal abscesses following middle ear suppuration have not been frequently observed. The writer reports four cases. The first, was an acute otitis media in a woman, aet. 47. In the neighborhood of the ear, descending half way down the neck, was a large fluctuating tumor; pressure caused pus to come out of the ear. The mucosa of the pharynx, especially upon the affected side, was greatly swollen. Mastoid edematous. On operation, the apex of the mastoid and the tendon of the sterno-mastoid were found necrotic. From this point, a cavity filled with ichorous pus passed down the neck, reaching backward to the trapezius, anteriorly being separated from the pharynx only by the mucosa. Facial paralysis appeared. Healing of the large abscess cavity, filled with necrotic masses, occurred after a prolonged time, being complicated by an aspiration bronchitis.

The second case was one of acute suppuration in a man, aet. 20, upon whom Schwartz's operation has been performed. Pain appeared in various joints two days later. An infiltrated painful point appeared behind the wound two weeks later. There was pain on swallowing and fever as high as 40°C. A second operation was without result; on the contrary, in the course of eight days difficulty of swallowing appeared and the posterior lateral wall of the

pharynx projected forward. Pus was discharged upon incision at this point, and for a few days the symptoms improved, recovery taking place after a second incision.

The third case was one of acute suppuration in the right ear of a man, aet. 56. On operation, an extradural abscess was found in the posterior cranial fossa. Three days later, a hard painful infiltration appeared on the right side of the neck and likewise on the right wall of the pharynx. Spontaneous rupture of the abscess occurred at this point. It was observed that pressure upon the cervical infiltration caused pus to come out of the bony cavity. A second operation revealed a large cavity filled with pus under the horizontal sinus, which reached backward and inferiorly to the pharyngeal mucosa. Recovery followed operation.

In the fourth case, paracentesis was performed on account of acute otitis. In spite of this, fever persisted for eight days. Pain upon swallowing and motion of the jaw which was present, disappeared after expectoration of blood and pus. The antrum being opened, a fistula was found on the floor passing anteriorly and inferiorly to the pharynx mucosa and discharging pus. After proper section, the condition was cured.

Levy.

Unusual Foreign Body in the Pharynx.

W. STANLEY SAMSON. (*The Laryngoscope*, Oct., 1901.) An unusual foreign body in the pharynx has been described by Samson; the patient, aged thirty-three, giving a history of nasal syphilis contracted six years ago. The bony septum had entirely sloughed away. A piece of this bone, becoming dislodged, had caught in a pocket of adhesions between the soft palate and the posterior pharyngeal wall. The plate of bone, after removal, measured 25 x 32 mm.

Seymour Oppenheimer.

Articular Complications in Non-Diphtheritic Anginas.

E. POINOT. (*Bulletin de Laryng. Otolog. et Rhinol.*, Mar. 30, 1900.) The thesis begins with a brief history of infectious pseudo-rheumatism. Then the author tries to establish the relations which join acute articular rheumatism, a specific disease, to the anginas, and shows that in true articular rheumatism the inconstant angina is in every case only an incident of the disease, and that we should not consider the articular symptom as even complications of the angina.

The author reports eleven observations of articular symptoms in the course of angina. In three cases they were simple arthralgias.

In four, there were acute non-suppurative arthritis. In the last four, there was suppuration of the joint. Of these eleven observations, two were personal.

Then the author reviews the etiology, pathogenesis, physiologic anatomy, symptomatology, diagnosis and prognosis of these complications.

Pharyngeal Abscesses Simulating Adenitis, or Sub-maxillary Adeno-phlegmon.

H. POIRIER. (*Bulletin de Laryng. Otol. et Rhinol.*, Mar. 30, 1900), commences by giving a very complete description of the pharynx from an anatomic point of view, laying stress on the description of lymphatic ganglia of that region, points of origin, in the vast majority of cases, of pharyngeal abscesses.

Then, having reviewed the etiology, symptoms and treatment of pharyngeal abscesses in general, he adds a special study of latero-pharyngeal abscesses. He dwells on their relative frequency in the adult, on the symptoms which distinguish them from retro-pharyngeal abscesses, and especially on those which differentiate them from submaxillary adeno-phlegmon, of which the most important is the presence of a *pharyngeal edema* in latero-pharyngeal abscesses.

The most rational treatment of latero-pharyngeal abscess is the external incision. Eleven observations are added, of which two are by Aviragent.

IV.—LARYNX.

Skin-Crafting in the Treatment of Complete Stenosis of the Larynx.

ANDREW McCOSH, New York. (*Annals of Surgery*, Nov., 1901.) After operations on the trachea where a tracheotomy tube has to be worn for a long time, stenosis of the larynx or trachea above the wound not infrequently takes place, and attempts to relieve this condition have been for the most part unsuccessful. Dr. McCosh reports a case in which laryngo-fission had been performed for

multiple papillomata of the larynx in 1895, tracheotomy having been done through the third and fourth rings. Since then the tube had been constantly worn. The operative procedures were begun in November, 1900, at which time the windpipe, from the epiglottis down to the second ring of the trachea, was completely obstructed. Chloroform was administered through the tracheotomy tube, and a three inch incision made in the median line of the neck from half an inch above the tracheal fistula to the hyoid bone. The larynx was found much shrunken and deformed, and on cutting into it no canal could be found. The trachea was much contracted, while the cartilages inclosed a solid tube of cicatricial tissue. Even a probe could not be passed through the glottis. The hyoid bone was divided, the laryngeal walls laid apart, and some of the cicatricial tissue excised. Considerable bleeding followed, and the wound was tamponed. This wound was kept open for thirteen days, chloroform again administered, the laryngeal walls spread apart by retractors, and a considerable amount of cicatricial tissue excised. An assistant was able, with the fingers in the mouth and the forceps pushed up from below, to push up the shrivelled epiglottis and to stretch the cicatricial contraction of the glottis so that a rubber tube, No. 22 (F), could be drawn upward. The remainder of the trachea was then opened, cleared of its cicatricial tissue, and the rubber tube laid in the new canal; its lower end, to which a string was attached, extending down to the opening in the trachea, and its upper end, to which also a string was attached, projecting out of the mouth. One suture of silk about the middle of the larynx drew its edges together and aided in retaining the rubber tube. Eight days later chloroform was again administered, the tube removed, the new laryngeal and tracheal canal made still larger by the excision of more cicatricial tissue, and its interior from the first tracheal ring to within half an inch of the glottis was grafted by a Thiersch graft taken from the thigh. This was rolled around a rod of gauze covered with rubber tissue, and laid in with the raw surface of the graft against the bleeding surface of the new tracheal canal. The section graft was about three inches in length. From the glottis a silk thread was carried, emerging from the mouth.

The graft took throughout its entire length, and three weeks later the anterior wall of the windpipe was formed by dissecting loose the skin edges of the wound and uniting them by suture in the median line, and a tube the size of No. 22 (F) inserted, its lower end resting against the tracheotomy tube and its upper end projecting through the mouth and attached at each end to the patient's neck and chest by strings. Two days after, the tube accidentally slipped out and was replaced under chloroform. With occasional changes the tube was worn continuously during the next three months, No. 24 (F) being the calibre which was most easily borne. At this later time an intubation tube was substituted, the previous tubes having been of soft rubber.

The intubation tube is occasionally expelled, owing to there being no arytenoids or projections to maintain it in place, and is sometimes not replaced for hours, during which time the boy breathes through his larynx. He can also breathe through it comfortably when the tracheal opening is closed by a pad of gauze. The intubation tube has remained out without sign of closure as long as 24 hours, and the author expects later to close the tracheal fistula and allow the patient to breathe through the newly formed skin-grafted artificial trachea and larynx.

(The subsequent history of this case will be of interest, and the reviewer hopes to report on it at a later day.)

Richards.

An Instrument for Papilloma Operations.

I. NEMIA, Budapest (*Monatschrift für Ohrenheilk.*), recommends an instrument devised by him for the treatment of papilloma in children. It is a simple metallic catheter having a round opening in the lower end, with highly polished edges so arranged that it may be placed in any position. Secondary injury is excluded by the employment of this instrument. In addition, the writer observes that in some cases, treatment of the recurrences of papilloma miscarries, and sometimes simple tracheotomy and the consequent rest of the larynx suffices for cure. Levy.

Laryngitis Submucosa Infectiosa Acuta.

A. ONODI. (*Archiv für Laryngologie*, Bd. XII.) Up to the present, there has been no unanimity of opinion as to whether we should consider primary erysipelas of the lar-

ynx, acute infectious phlegmon of the pharynx (Senator) and angina Ludovici as identical diseased conditions of different intensity, or as conditions requiring a more distinct division. The writer reports three cases. Fraenkel's diplococci were found in one case and staphylococci in the others. If we hold that the cause of erysipelas, in accordance with recent investigations, agrees with the cause of suppuration, in so far that either of these may produce pus or erysipelas, we must join in the writer's opinion that all of these affections must be grouped under the name announced in the title. The special variety may be indicated by adding the word erysipelatosa, phlegmonosa or necrotica.

V.—MISCELLANEOUS.

The Hemorrhagic Diathesis in Relation to Operation on the Nose and Throat.

E. HARRISON GRIFFIN, New York. (*Medical Record*, Dec. 7, 1901.) Several cases of profuse hemorrhage after operations of moderate severity, and in which the patients denied the hemorrhagic diathesis, are reported. In one instance, after removal of a portion of the inferior turbinate, severe hemorrhage followed fifteen minutes after the operation, and when the nose was thoroughly plugged the hemorrhage continued through the lacrimal duct. The plugs were removed on the fourth day, but on the sixth day after the operation, a severe hemorrhage, requiring plugging of the nose and the administration of morphin, appeared. Careful investigation of the family history revealed the fact of the patient's being a bleeder.

In another instance, after the excision of the tonsil there was copious bleeding for several hours until fainting took place, and oozing continued to the fifth day.

Another case is cited of a girl of sixteen, in whom, after removal of the tonsils, hemorrhage continued off and on for one month.

Another case that bled after operation for an obstructed nose, on examination developed the history that only a week before he had come near bleeding to death, and had

to have a transfusion of milk to save his life. Notwithstanding this he denied the hemorrhagic diathesis until closely questioned.

The author also quotes a case in which severe hemorrhage followed an operation for deflected septum. The patient was sent to the hospital for the hemorrhage, left in three days, and two days later hemorrhage again took place, and this time was so severe that the patient died.

In all of these cases there was a hemorrhagic diathesis. Hence the need before any operative procedure to inquire very closely into the question of the presence of any hemorrhagic diathesis. It is necessary to go into every detail since the patient will frequently deny all knowledge of being a bleeder.

Richards.

Cinchonism and its Effects Upon Articulation and Vocalization.

CARL SEILER. (*Medical Record*, Oct. 26, 1901.) Carl Seiler discusses a series of tests of the effect of tinnitus aurium, and aural symptoms of what is generally called cinchonism, as well as of external nonsubjective noises, upon vocalization, and particularly upon articulation, most prominently noticed by the subjects in the pronunciation of certain of the consonants.

The ordinary tinnitus due to middle ear disease never transgressed the limits of pitch from "d, 287 vibrations, as the lowest point to the "f²," 704 vibrations, as the highest. These subjective noises would invariably affect the perception of sound, but had no appreciable effect upon vocalization or articulation.

The subjective noises of so-called cinchonism, as produced by the systemic toxic effects of various drugs, were found to be invariably of high pitch; lowest when quinin was used, and highest when salicylate of soda produced the subjective sensation.

Any composite sound of high pitch, such as the hissing of escaping steam, not only interfered with the pronunciation of these consonants which have for their characteristic a combination of sounds of very high pitch, such as "th," "s," "st," "z" and the like consonant sounds of articulate speech, but also caused them to be easily obliterated, and consequently most difficult to be appreciated and recognized by the ear.

This is explained by the well-known acoustic law of interference with each other of sound waves of the same, or nearly the same, length, and that the higher the pitch of two non-harmonious sounds, the greater the difference can be in the number of vibrations allowing interference. But acoustic or physical laws fail us completely when a subjective, in reality physically non-existing noise, such as that of cinchonism, materially interferes, as it undoubtedly does, with the pronunciation of those consonants of high pitched composite characteristic sounds, and even alters the quality and timbre of the high-pitched vocal sounds.

Seymour Oppenheimer.

Subcutaneous Paraffin Injections.

FERD ALT. (*Monatshefte für Ohrenheil.*, Bd. 35.) Gersuny has used for two years, for plastic purposes, paraffin melting at 36 to 40°C. This method has been of service in cases of incontinence when there was destruction of the sphincters, also for the improvement of speech after cured perforation of the palate and to close smaller perforations in similar cases. The best results are observed in the correction of deformities, especially saddle-shaped nose. The writer has employed this method after the radical operation where a large opening remained behind the auricle. After injection of cocaine, the paraffin is injected around the border of the opening in four places, about one-half cubic centimeter altogether. Reaction is slight. The fistula was so small that it would only admit a bristle. Besides this, the writer employed the method in a case where perichondritis of the auricle with disfigurement followed the radical operation. Injection of a small amount caused the crumpled auricle to assume its normal length and breadth. In a similar way congenital deformities may be corrected.

Levy.

Foreign Bodies in the Bronchi.

E. JURGENS. (*Monatschrift für Ohrenheil.*, Bd. XXXV), employed systematic massage of the back several times a day in a case in which a large piece of bone fell into the right bronchus. The foreign body was coughed up fourteen days later, during treatment. The writer believes that this method was responsible for the result.

Two New Cases of Foreign Bodies in the Bronchus.

O. WILD. (*Archiv. für Laryngologie*, Bd. XII), assistant

of Killian, reports two new cases which were diagnosed and operated upon after his method.

The first case, was a woman, in whom a piece of bone lay in the right upper bronchus. Killian attempted to deliver it by turning the patient to the opposite side after introducing the laryngoscope. After Killian introduced the tube and cleared away the mucus with cotton, it was seen that the foreign body had changed its position and after a few days it was found in the inferior bronchus. The removal was difficult since the mucosa was swollen over it like a ring. After tracheotomy, the foreign body was seen through the agency of inferior bronchoscopy and Killian recovered it with a Lister's bent hook.

The second case was a six-year-old boy, in whom a piece of a bean entered the air passage. In three days the temperature rose to 39° C. with intense dullness in the right inferior lobe. Direct bronchoscopy was undertaken under narcosis and the bean was found in the right main bronchus. An attempt to remove it with a sharp tenaculum was unsuccessful, on account of it being a dry bean. Then an attempt was made to place a blunt hook behind the bean, to press it against the lower opening of the tube and thus to remove it. It was possible to move it, but only a piece of the cortex of the bean came out with the tube. The bean fluttered here and there in the trachea. It was therefore necessary to introduce the instrument again when it was possible to remove the bean in pieces with a pair of forceps. The course was entirely normal.

In this case, the reintroduction of the tube was an unfortunate occurrence, since it necessarily prolongs the operation. On this account, Killian constructed a conducting tube with a slit, which can remain during the entire operation and it is possible thus to remove large foreign bodies whose greatest diameter corresponds to the slit of the conducting tube.

Levy.

Speech as a Factor in the Diagnosis and Prognosis of Backwardness in Children.

G. HUDSON MAKUEN (*Journal of the American Medical Association*, Oct. 12, 1901) concludes that it is not always possible to determine at a glance the cause of backwardness in children, and that backwardness is not always due to the central lesion, but may be the result of arrested

cerebral development, due to some abnormality of structure in the peripheral organs.

The speech centers are so closely related to the ideational centers of the brain that any impairment of the one generally results in a corresponding impairment of the others. The best method of arriving at even a proximately correct prognosis in cases of backward children is to apply the speech test, or, in other words, to ascertain by careful study and experiment to what extent the faculty of speech may be improved, and it will be found that in those who are susceptible to training in what may be called the refinements of speech are the ones for whom we may promise the best results, and that possibilities for general development will be proportional to the capacity for speech development.

Seymour Oppenheimer.

Removal of Foreign Bodies From the Air Passages.

WILLARD DE FOREST (*Journal of the American Medical Association*, Oct. 26, 1901), in a resume of the subject, concludes that coughing should be encouraged, and forcible inspiration restrained. Inversion in the prone position, as a domestic practice, is advisable. Laryngoscopy is helpful if the body is lodged at the vocal cords. It may be extracted by forceps or by laryngotomy. If time permits, the X-ray may be brought into serviceable use for diagnosis. Careful diagnostic investigation is important to determine the actual presence of an impacted body, and its location. Tracheotomy under local anesthesia should be the rule if the object is lodged at the bifurcation or in the bronchi. Tracheoscopy, suction and forceps' manipulation must be cautiously employed. Prolonged instrumentation adds greatly to the danger of pneumonia. If extraction is not secured through the tracheotomy wound, the chest wall should not be invaded unless an artificial respiratory apparatus, like the Fell-O'Dwyer, is at hand, and oxygen available. With the assistance of these appliances, however, the bronchus may be reached, anteriorly or posteriorly, since, by their use, rhythmical movements can be maintained.

Resultant abscess of the lung should be treated by incision and drainage.

Seymour Oppenheimer.

The Bucco-Naso-Pharyngeal Origin of Meningitis.

JACOBSON. (*Bulletin de Laryng. Otol. et Rhinol.*, Mar. 30,

'01. Ordinary tubercular meningitis seems to have its origin on the niveau of the oral, nasal or pharyngeal mucosas. The germs journey along the lymph and blood vessels, and also the sheathes surrounding the nerves. Although their point of departure is the niveau of the mucosas the observer finds them only in the deeper tissues and organs, since the primary lesions have had time to be cured, after having given passage to the germs to the ganglia and deeper structures. The organs which receive the pathogenic microbe, very often in a latent state, are the ganglia, tonsils and the adenoid organs.

BOOK NOTICES.

Transactions of the Tenth Meeting of the German Otological Society.

Verhandlungen der Deutschen Otologischen Gesellschaft auf der Zehnten Versammlung in Breslau am 24 and 25 Mai, 1901. Jena, Gustav Fischer. 8 marks.

Dr. Hartmann has presented a carefully edited, and of course authoritative, volume. Besides the business matters of the society and exhibitions of cases, instruments, etc., there are 29 original papers, with the discussions upon them. I can do no better than to give the titles of the most important ones, for a review or critique can scarcely be within the functions of the reader. (1) and (2) The present condition of the theory of otogenous pyemia; (3) Musical disturbances in hearing; (8) Intranasal vaporization; (18) Study of overtones, harmonies, and the Helmholtz theory of tone perception; (19) What is the origin of vertigo? (20) Entotic tones; (21) Origin of deafmutism; (23) Chronic otitis of the temporal bone; (24) Caries of the ossicles; (25) [Four cases of rhinoscleroma; (26) Path of infection in meningitis after frontal sinus suppuration; (27) Muscles of the right ethmoid bone; (29) Treatment of middle ear disease.

The discussions provoked are necessarily of interest, but cannot be abstracted. The publisher, who has recently issued these transactions from the fourth meeting in Jena, 1895, offers the six volumes together at a price of 21 marks. If they all are as valuable as the one before me, this is a bargain indeed. A. B. HALE.

Klinische Vorträge.

Klinische Vorträge aus dem Gebiete der Otologie und Pharyngorhinologie. Herausgegeben von Prof. Dr. Haug (München) Jena; Verlag von Gustav Fischer.

(1) Fünfter Band, Erstes Heft. Ueber Erschütterung des Ohrlabyrinthes (Commotio labyrinthi); von Dr. R. Spira in Krakow. 1 mark, 80 pfennig.

(2) Vierter Band, Sechstes Heft. Die Entzündungen des Äusseren Gehörgouges, von Wilhelm Grosskopff in Osnabrück. 60 pfennig.

(3) Die Bacteriologie der Acuten Mittelohrentzündung von Dr. Hasslauer. 2 marks, 50 pfennig.

These lectures, so-called, are in reality nearly exhaustive monographs on their special subjects, and contain a newer literature and often fresher presentation of the subject than can be found in the average text book.

No. 1, on Commotio Labyrinthi, is as its title implies, restricted to the discussion of functional disturbances of the labyrinth, what

is roughly termed Meniere's Disease. The author uses the classic arrangement of etiology, symptomatology, pathogenesis, diagnosis, prognosis, forensic significance (a valuable suggestion), prophylaxis and treatment. Whether there is to be found in it anything new, must be left to the judgment of the individual reader, based upon his experience and knowledge of the subject, but certainly no one can help being better informed and more alive to the subject after reading these 70 closely printed pages.

No. 2. The Inflammations of the External Auditory Meatus is a delight for its clearness and simplicity. The author admits of but two characteristic conditions: circumscribed and diffuse otitis externa, the former advisable into acute and chronic (furunkel), the latter into simple, hemorrhagic, croupous, diphtheritic, ulcerous and parasitic. Nearly all of the fourteen pages discuss treatment, thorough and easily applied.

No. 3. The Bacteriology of Acute Otitis Media is a systematic investigation produced after the manner of an inaugural thesis. The reviewed literature embraces 158 references (chiefly German). The author examined 58 middle ears on 29 fresh cadavers. Of these, six had a purulent inflammation and were therefore excluded. Four had fluid in them. The remaining 48 were macroscopically normal. Of these, 23 contained pathologic organisms, 21 were sterile.

Hasslauer puts these questions, the answers to which he gives at the end of the study. These questions are:

- (1) How do germs enter the middle ear?
- (2) Is the normal middle ear free from germs?
- (3) Is the simple presence of germs sufficient to produce an inflammation, or must some exciting cause act as stimulant to its production?

His conclusions are as follows: (1) Germs enter by (a) the Eustachian tube; (b) the lymph spaces connecting nose with middle ear; (c) the external ear, after perforation; (d) blood and lymph vessels.

(2) The normal middle ear of animals is not free from germs necessarily.

(3) Germs alone do (will) not cause an inflammation; for this some existing cause is necessary.

Such work is well worth reading, and forms a solid ground on which to erect our structure of diagnosis and treatment.

A. B. HALE.

Traité Médico-Chirurgical de Maladies du Pharynx.

E. Escat, Paris, Georges Carré et C. Naud, 1901.

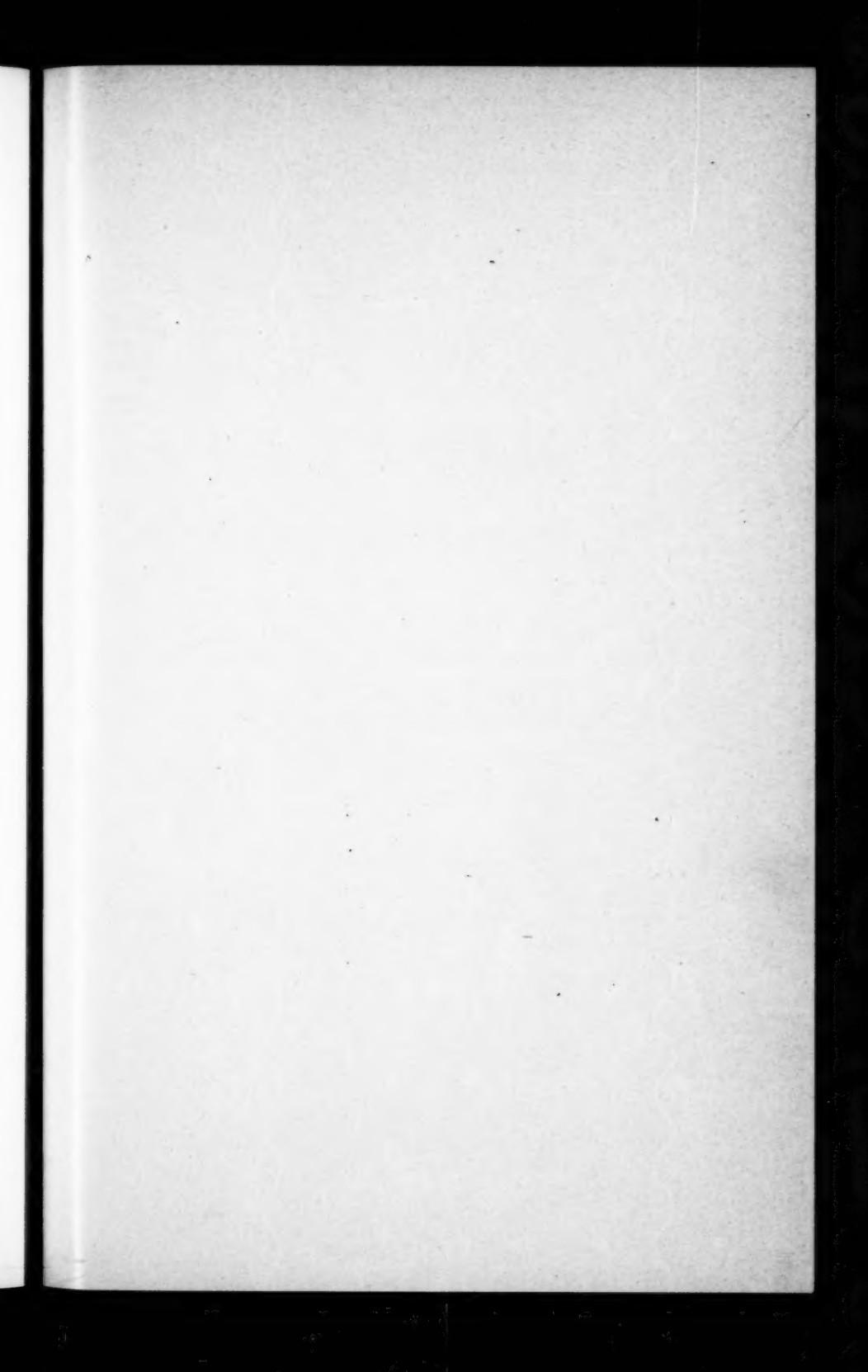
This most excellent work has many features to commend it, even to those who have practiced laryngology for years. Not the least of these is the classification of pharynx diseases. For instance, the acute inflammations of the pharynx are divided into the acute superficial (affecting the mucosa alone), the submucous, and the variety affecting all the tissues. Of the first of these he makes three

groups: Catarrhal, including palatal, pharyngeal and lingual amygdalitis, and the pharyngitis of rheumatism, scarlatina, measles, grip and typhoid fever; the vesicular comprising infectious herpes, buccopharyngeal zona, herpes récidivant and the pharyngitides of variola, varicella and aphthous fever; the pseudo-membranous, including diphtheria, streptococcal, pseudo-membranous and diphthero-streptococcal infection and the pseudo-diphtheritic infections of staphylococcus, pneumococcus, bacterium coli, bacillus of Friedländer cocci, oidium albicans, tetragenus, etc.

Under the classification of submucous anginas he groups abscess of the palatine, lingual and pharyngeal tonsils, peritonsillar, retro-pharyngeal and latero-pharyngeal abscess.

The chapters on syphilis and tuberculosis are particularly well written. Primary syphilis of the pharynx is minutely described, the chancres themselves being properly considered in accordance with the different varieties attacking the pharynx, viz., the erosive, ulcerative, vegetative, diphtheroid, gangrenous and the anginous form. The difficulties of diagnosis are pointed out and the way made clear as possible.

The writer believes that primary tuberculosis of the pharynx begins in one of the four tonsils resulting from inoculation with the tubercle bacillus. In secondary tuberculosis the infection takes place in one of three ways: Ascending through the respiratory passages, through the lymphatics (rare) or through the blood. The disease may be acute or chronic, the latter including the chronic ulcerative, the chronic vegetative and the chronic suppurative forms. The last two hundred pages are devoted to tumors, adhesions, neuropathies, hemorrhages, foreign bodies and malformations. A most valuable addition to the literature upon the pharynx.





Case 7.



Case 2.



Case 3.



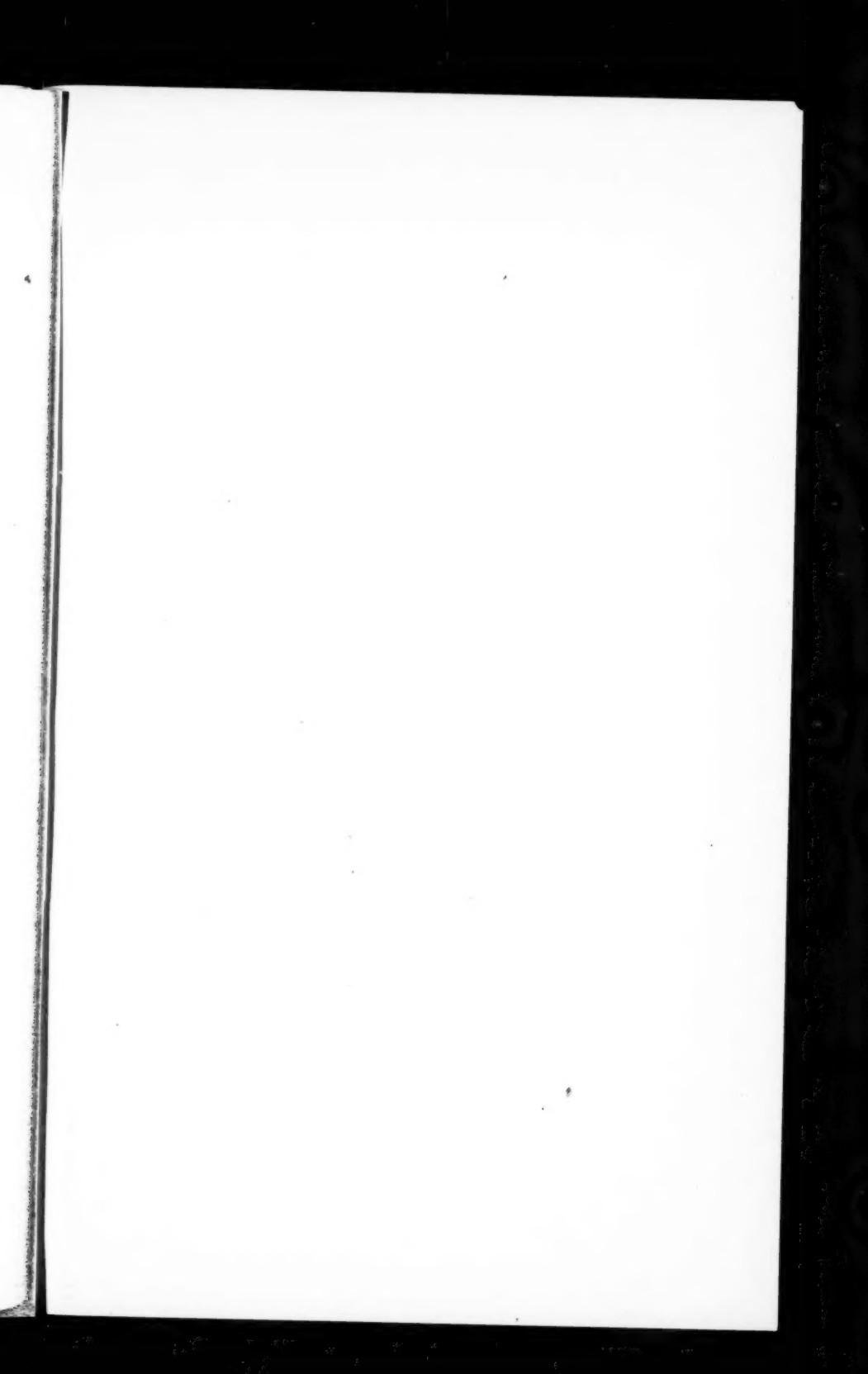
Case 4.



Case 5



Cases 6 & 7.





Dr. Robertson's Case.



Dr. Ballenger's Case.

